PUBLIC LIBRARY APP PROVISION ACROSS SCOTLAND: THE ATTITUDE AND OPINIONS OF THE AUTHORITIES AND PUBLIC

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Hi Kinai! :)

Abstract

This study looks at the current provision of library apps in Scottish Public Libraries with the aim of assessing public opinion and the state of such apps across the country. Neither library apps nor Scottish Public Libraries have been subjected to such a study before, so should provide a novel insight into how public libraries are developing in this area.

Literature has concentrated on academic libraries or large national libraries when considering apps. The review covers Web 1.0 to Web 3.0 and Library 1.0 to 3.0 as background before considering the lessons to be learnt from commercial apps and the changes in public expectation.

Two online surveys, one for the Authorities and the other for the public were carried out . The results were analysed using Mann-Whitney and content analysis techniques.

Seventeen Authorities have a library app, two have an app in development and thirteen have no app. The main reason for providing an app was to offer an alternative means of communication with patrons and the main reasons given for not providing an app were cost and low priority. Librarians were satisfied with the core services offered but less so with others. The public are satisfied with current library apps however criticism was expressed on the complex procedures required to access external services. Patrons from Authorities without an app stated that they would use one if it was well designed and easy to use.

The results from this study should be of interest to local authorities, librarians and app developers. Hopefully it will inform them of the actual rather than perceived demands of the public and to help aid future development decisions in this area.

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1.0 Introduction

It is now universally accepted that libraries must have an internet presence. The current debate is on whether a dedicated mobile app is necessary or if an optimised website is sufficient. Apps are not websites and even optimised websites have several disadvantages compared to a dedicated app. It has been estimated that, in the USA, users spend over 80% of their online time on a mobile device on a core set of apps, mainly social media and games, compared to less than 20% of time accessing the internet through a browser (Spence, 2014). In other words, people like them and are comfortable with the concept and features of an app.

The speed at which mobile technology has been adopted by the public is unprecedented and has presented public services with the problem of taking up this technology in a safe, secure and effective manner. The mobile revolution has arguably been one of the most fundamental in its effects not only technologically but culturally, legally, socially and economically. The major change has been the fusion of smart and mobile technologies. The ability to easily access the internet from a handheld device anywhere with a mobile network signal has radically altered the way people get online. Previously, internet access was fairly static in that it had to be done either through a deskbound computer or through a laptop with limited mobility and access. By virtue of being physically smaller devices and continued improvements in battery technology, tablets and mobile phones have enabled greater access to the internet. The minimal amount of infrastructure required in order to set up Wi-Fi and 4G networks, in conjunction with the relatively low cost has produced a truly global network accessible across the economic spectrum. The favourable cost of smart technology compared to laptops or computers has exposed it to large sections of the world's population, thus helping bridge the digital divide. An example of this is the global uptake of mobile phones and to a lesser degree smartphones in the developing world. Mobile phone ownership in Kenya was 82% compared to 89% in the USA in 2014 (Pew Research Center, 2015). This is why the presence of a library app is desirable. An app helps extend the library's reach to as many patrons as possible and crosses both cultural and economic boundaries. As of 2015, 63% of adults in Scotland own a smartphone (UK average is 66%) and the uptake of 4G rose by 25% between 2014 and 2015 to 55% (UK average is 45%), principally attributed to the increased coverage of the 4G network (Ofcom, 2016).

The fact that smart devices are multifunctional combined with the portability of smartphones and tablets allow for functions like QR code and barcode scanning, RFID technology and self-service, which would be impractical on a larger device. While facilities such as pinch and zoom and touchscreen navigation which are inherent to an app can be emulated by an optimised website, this will not hold true in the future. As smart technology continues to develop new capabilities such as voice recognition and iris scanning will only be readily available through smart devices and hence apps but not websites. The pressure on libraries to incorporate these developments will only grow. Delaying the implementation of such services will only add support to an unfortunate view of the library as an outdated institution.

As previously stated, the majority of time on smart devices is spent on an app rather than on an internet browser. This indicates that simply having online access to a service is not enough. A dedicated app is a necessity to engage the mobile patron. However as apps are predominantly used for social media, libraries are competing with the likes of Twitter, Facebook and YouTube for the attention of the patron. The public is increasingly used to having constant access to all services at their convenience in both time and place and so it behoves libraries to cater to this expectation. The onus is now on the library to provide the service that the public wants rather than the public taking the service that the library gives.

Not surprisingly library apps were first developed within institutions. They have the advantage of having a specialist cohort to cater to (e.g. university students or medical staff) who have a vested interest in using the app. National libraries and museums have a wider, less involved audience but have either a large catalogue of specialist items and/or a major collection of exhibits to act as the attraction to their app. According to Pianos, some of the earliest library apps were documented by Pohla in June 2010, in which thirty-six iPhone library apps, eleven Android apps and one Blackberry app were counted (Pianos, 2012). Many of these earlier apps first came out from institutions in the USA.

Despite the proliferation of mobile apps and smart technology, there has been little done to review the state of use and perceptions of this technology within academic library settings and even less within public libraries. This study will be the first to look at app provision services in public libraries across Scotland and review the opinions held by the public of those that do exist and to ask what services they would like to see in a library app. This study shall therefore ask:

1) What is the current state of library app provision in Scotland?
2) What is the attitude of library patrons towards the library apps that are currently provided?
3) What services would the public like to see in a library app?

The aim here is to address the deficit of information by examining the literature and conducting a survey on the number and nature of public library apps within Scotland. For the study, each Scottish Authority was contacted and asked to fill in a survey to determine the current state of library app development within their area. In parallel with this, a public survey was conducted through the libraries to determine general opinion on library apps. The Scottish Authorities Survey received a response from all thirty-two areas representing a response rate of 100% and the public survey received a total of 185 responses from across the country.

2.0 Literature Review

In this section, Web 1.0 – 3.0 and Library 1.0 – 3.0 are reviewed. Apps from the commercial and government sectors are examined as examples of apps with large numbers of public users. Four papers using surveys in a library setting are studied, detailing the changing attitude of patrons and library services towards mobile services.

2.1 Web 1.0 – 3.0

Web 1.0 can be identified by default as the period between the creation of the internet and the appearance of tools and trends which defined Web 2.0. During this phase of internet evolution, information remained fairly static. It was possible to find and view webpages but not to edit or interact with them.

Web 2.0 developed around ease of interaction online through the ability to share and exchange information and media. Documented features which distinguish Web 2.0 include the ability to label or tag information in order to facilitate its spread and retrievability and the creation of social networks to further interaction between individuals and groups e.g. Facebook. Web 2.0 enabled users to contribute to the development of webpages through being able to comment. The dynamic, interactive, nature of Web 2.0, allowing the user to edit and build upon the Web, instead of only being able to view a webpage has allowed for the formation of communities such as YouTube or Reddit, in a way which was not previously possible with Web 1.0. Web 2.0 has also encouraged "users to cooperate effectively for the offer of virtual services and content organization" (Catarino and Baptista, 2008, p.100) which is shown through the development of tagging functions and the communal sharing of information e.g. Imgur, TV Tropes, Twitter and wikis. Social networking sites have been defined in literature as: "allowing individuals to (1) construct a public or semipublic profile within a bounded system, (2) articulate a list of other users with whom they share a connection, and (3) view and traverse their list of connections and those made by others within the system" (Ellison, 2007, p.211). The greater level of connectivity between people is one of the identifying characteristics which differentiates Web 2.0 from Web 1.0. Social networking has not only been widely adopted by the public but has also been recognised as having potential for facilitating business, education and cultural interactions (Sinclair et al., 2010).

Implementing the tools from Web 2.0 and the philosophy of Library 2.0 into a library app requires imagination, planning and a commitment of resources. These are best shown by some of the major libraries in the world. New York Public Library has a Twitter account with approximately 1.61 million followers (New York Public Libraries, 2016) which enables "the patrons of NYPL [to] interact with the library staff [through] their Twitter account" (Kumar and Thanuskodi, 2015, p.59). The British Library has developed YouTube clips to augment its current exhibitions (The British Library, 2016). The National Library of Scotland uses Facebook to promote its special collections and facilitate dialogue with its patrons (National Library Of Scotland, 2016). The Smithsonian uses Tumblr to illustrate their catalogue in a light hearted fashion to attract patrons to view their collections (SILibraries, 2016). The Glasgow Women's Library runs a popular blog from its library website which is used to look at the goings on at the library (Glasgow Women's Library, 2016). These examples are by no means unique but are illustrative of Web 2.0 resources in use by library services. By implementing QR codes to allow access to the library's online catalogue for information on and availability of items, thus being able to easily reserve said items for future collection. QR codes could also be used to link to external resources or other resources from within the library e.g. CREDO Reference, a database of reference materials. Many libraries already subscribe to such resources and by increasing their exposure through the use of QR codes, libraries can optimize the return on such subscriptions. As Craig states:

The list of possibilities for incorporating QR codes . . . is only limited by willingness to experiment. For administrators and instructors with an interest in adopting new technology . . . QR codes are an easy-to-use and inexpensive option (Craig, 2012, p.136).

Other services which libraries can provide include text or email alerts for patrons to inform them when new stock or requests are available.

Web 3.0 has been defined as "the third-decade of the Web (2009-2019)" (Spivach, 2016) and also as "the creation of high-quality content and services produced by gifted individuals using Web 2.0 technology as an enabling platform" (Calacanis, 2016) by different experts in the field. One of the main components of Web 3.0 is the semantic web, which aims to provide "a common framework that allows data to be shared and reused across application, enterprise, and community boundaries" (W3C, 2013). By using a common framework and metadata vocabularies, the intention is to make it simpler to link information together and find other relevant data. Widespread adoption of the Resource Description Framework (RDF), a language for representing information on the web, has

also been thought of as part of Web 3.0 and was first formally recommended by W3C in 1999 (W3C, 1999). The creation of items which are self-descriptive and able to integrate and understand information from other sources, no matter the format, will allow users to ask questions in natural language, instead of using keyword searches and receive a comprehensive response. Another major part of Web 3.0 is the integration of cloud computing by which all devices are interconnected via the internet. At the moment, this is more of an aim than reality as the implementation of the technology is still in its early stages.

2.2 Library 1.0 – 3.0

Library 1.0 is not easily defined and may be best represented by its characteristics as "a restrictive place, governed by strict hierarchies, rigid boundaries, and underpinned by change-avoidance" (Casey, 2005). It has also been described as "a linear management model mainly aiming at literature resources. And the professional work consisted mainly gathering, processing, managing, storing and utilizing printed literature"(Yang et al., 2009, p.284). To a certain degree, Library 1.0 is a mind-set held by some management and staff whereby library services are provided in a top-down manner, with an emphasis on resource management.

Library 2.0 has been distinguished from Library 1.0 by having four core principles: "It is user centric. . . . It provides a multi-media experience. . . . It is socially rich. . . . It is communally innovative." (Maness, 2006). This encapsulates the essence of change from the library-centric approach of Library 1.0 to a less certain model where the librarian is no longer in control of the information but instead works in collaboration with the community. It was appreciated, even at this stage, that this represented just a temporary phase in the development of the Web and that the library would need to continue to evolve and adapt as the technology changed. As Maness went on to conclude: "Web 2.0 is an early one of many, libraries must adapt to it, much as they did the Web originally. . . . any stability other than the acceptance of instability is insufficient" (Maness, 2006). Library 2.0 has impacted upon much of the service that libraries provide and the way that it is provided, ranging from the implementation of e-learning (Huang, 2015), to how libraries communicate with their patrons (Walia and Gupta, 2012) and the provision of materials in digital format (Martindale et al., 2015) as well as physically. The era of Library 2.0 was when an appreciation of the different methods by which information could be viewed, presented or manipulated via Web 2.0 first gave rise to exciting possibilities. At the same time, the sheer quantity of information available made librarians acutely aware of the necessity of aiding their patrons in information literacy and helping

their users to handle information constructively. The librarians' role was now in facilitating their users' information needs rather than guarding library resources.

Fiander, when considering libraries and social media makes numerous relevant points concerning the style of social media sites, how they differ from each other and comments on how a library could make advantageous use of such sites (Fiander, 2012). He also emphasised the necessity for administrators to have specific policies regarding how the library service should conduct itself on the various social media platforms. These must provide sufficient guidance to staff but with inbuilt flexibility to permit a direct response. Points for specific platforms included:

- Blogs – The library should ensure that they use a institutional web address and not a blog server address as this looks more professional and obviates the need to change the address if the server is changed.
- Twitter – Is primarily a customer service medium, used for service announcements, event promotion and collecting customer feedback. Library staff should have permission to respond speedily to observed comments, assuring the commentator that they have been acknowledged. Twitter is a conversational platform and thus two-way communication should be encouraged.
- Facebook – Should be viewed as a community marketing tool. It is a social platform, not a monthly newsletter and as such needs to be updated at least once per week. It takes time and attention to nurture a successful profile. Library events should not simply be posted on the profile wall but rather be specific open Facebook events which allow the public to indicate interest and share the event with their friends. Fiander also gives extensive guidelines on how to set up an institutional profile correctly.

With the advent of Web 3.0 technologies has come further possibilities for the further evolution of libraries and librarianship, this has been labelled as Library 3.0. It has been questioned whether there is a difference between Library 2.0 and Library 3.0 however attempts to refine the differences between the two have been made, see Table 1.

Table 1 – Summary of major differences between Library 2.0 and Library 3.0 (Kwanya et al., 2012)

Library 2.0	Library 3.0
Social Web	Semantic Web
Network of links	Network of data (meaning)
Disintermediation	Apomediation
Collective intelligence (wisdom of the crowd)	Selective intelligence (wisdom of the expert)
Quantity of information (information overload)	Quality of information
Folksonomy	Ontology and Resource Description and Access
Communal environment	Personalized environment ('my library')
XML and Asynchronous JavaScript and XML (AJAX)	Resource Description Framework (RDF)
Dumb searching based on keywords	Smart (intuitive) searching in natural language
Some items categorized as Invisible Web are inaccessible	All-visible, all-accessible Web

Kwanya also proposes the following as the main principles of Library 3.0:

- The library is intelligent
- The library is organised
- The library is a federated network of information pathways
- The library is apomediated*
- The library is 'my library'

*(I.e. the librarian is no longer a conduit between the patron and information sources but is instead an advisor or guide to the information sources.)

Library 3.0 aims to connect users with multiple sources of information. Based on their profile and the context in which the information is sought, new sources of information can be brought to the patrons' attention by highlighting connections which they may have missed on their own. These linked databases can consult with each other to open access to information which was previously harder to link and to provide a personalised experience for each individual based on past history. These services would hopefully encourage more community participation with the library, enabling global participation as well as local. The role of the librarian in Library 3.0 has moved on from the shelf-stacking and book-stamping of Library 1.0, to being able to handle information in multiple formats, still with the aim of providing information to all equitably without prejudice. This will require training the librarian in the use of the latest technologies in order to, in turn, facilitate the patrons' use of those same technologies, with the goal of helping patrons learn to use this technology on their own. One of the major lynchpins of Library 3.0 is the interconnectivity of systems, databases and the ability to recognise individual patrons. As such it is important to

successfully incorporate context-awareness technology into the library system in order to deliver an intelligent library which is tailored to the individual. This was neatly summarised by Noh as:

. . . seamless use of technology, providing the information and services desired by users by combining the users internal and external contextual information such as users' preferences, history, behaviour, and the current time and place in an optimized environment, will be the future of the next generation of digital libraries (Noh, 2013, p.237).

There are different definitions along the same lines but there appears to be a consensus that the main aims of Library 3.0 are "to establish a semantic relationship between all available Web contents to ensure seamless accessibility, search-ability, availability and usability" (Chauhan, 2009). Just as the introduction of social media networking to the library inducted Web 2.0 technology into the library service, likewise a library app is a step towards Library 3.0 and bringing in Web 3.0 technology such as recommender functionality, cloud-based services and natural language search capability.

2.3 Commercial Apps

Amazon.com Inc. is one of the world's largest online retailers, middlemen and distributors. The rapid development of its app services is an exemplar of the standard which such services need to meet in order to thrive. The Amazon app for iPhone and iPod touch was first introduced on the 3rd of December, 2008 (Internet Business News, 2008). This was quickly followed by a release for Blackberry on the 9th of April, 2009 (Telecomworldwire, 2009). It is clear that it is important to Amazon that its services are available to as wide a customer-base as possible. In 2012, it was announced that the PayAnywhere app would become available through Amazon.com (Burns, 2012). This service would allow any mobile device to be used for card transactions and aimed to expand Amazon's offering for its vendors and more cautious online consumers. In 2013, Amazon reported that its Appstore had now been expanded on Android to cover almost two hundred countries (Business Wire, 2013). Mike George, Vice President of Apps and Games at Amazon said: "Amazon's platform is a complete end-to-end solution for developers wanting to build market and monetize their apps and games". More recently, the Amazon app was launched in an Apple Watch compatible format (Business Wire, 2015) and included features such as 1-Click purchase, Add to Wish List, Search the Amazon Catalogue and voice search functionality. The main points to note are that the apps have been constantly updated with the principle aim of facilitating its use for its vendors and

customers while at the same time, extending their customer-base as much as possible and thereby making their platform more attractive to third-party developers and merchants. As the general public becomes more comfortable with these services, their expectations from public service apps, including libraries, will rise to demand similar levels of service provision. One of the strengths of e-commerce websites/apps, like Amazon, eBay or Alibaba, which could be adapted by library services is the recommend function. A personalised recommender system could be implemented to suggest books or other material from the library's catalogue to patrons based upon their past history. If user reviews were implemented, these could also be used by the recommender system. It would be imperative to ensure that any such system was secure and respected the law and the patrons' privacy. By evaluating the type of book and evaluating patron reviews, Jia outlines how to implement a library recommender system by building up a bank of user reviews, including a method for incorporating new titles. With the evaluation of books through a suite of appropriate algorithms, patrons can enjoy a 'humanized' recommender service tailored to the individuals' tastes (Jia and Shi, 2013).

Like Amazon, eBay is one of the most popular commercial apps on mobile devices. Part of its success is down to its quick appearance on the platform and taking advantage of its technological edge on its competitors in order to create and consolidate its place in the market, making over $400 million in sales through their app in 2009 (Gelles, 2009). In order to remain successful, eBay has had to innovate and make itself available to as many customers as possible by launching on Windows (Wireless News, 2010) and Android (Health & Beauty Close-Up, 2010) with services such as: Buy Alerts, Daily Deals, Feedback, My eBay – easy access to watched items, listings, sales and bidding, Member Messages, Sharing – through social media and email, Payment through PayPal and Voice Search. eBay continued to adapt by acquiring barcode scanning software through the takeover of RedLaser (Journal Of Technology, 2010). eBay has also worked in partnership with other companies to provide innovative services, for example the sale of customisable 3-D objects (Moscaritolo, 2013). Virtual try-on allows customers to impose an image of fashion accessories onto a picture of themselves on live video (Corcoran, 2011). In partnership with Myer, eBay launched the first virtual reality department store, allowing consumers to travel through the store and select items to view by looking at them (M2 Presswire, 2016). The app was made available from the launch of the Apple Watch in 2015 (Preece, 2015). One of eBay's main criticisms has been its response to security breaches. They were slow to respond to the hack claimed by the Syrian Electronic Army (SEA) in early 2014, not even acknowledging that the breach had occurred until May (Price, 2016). Unlike other large online companies such as Google or Facebook, eBay does not reward honest hackers

who report security flaws (Vincent, 2016). The lacklustre response to security threats risks undermining the public's trust in the company which would be extremely detrimental to their reputation. The companies questionable attitude towards security has continued until as recently as this year, when a security flaw was only partially patched, instead of fully corrected (McCallion, 2016). Librarians can learn from the positive and negative aspects of commercial websites and apps. It is important for the app to be available on as many platforms as feasible, update frequently, be sensitive to the patrons' wishes and needs and to maintain tight security in order to safeguard the libraries position as an institution trusted by the public.

2.4 Government Apps

The popularity and ease of use of apps has been quickly noted by governments. Since a lot of governance involves having to contact the population and vice versa, the smartphone app is an ideal method of communication. The possibility of having paperless transactions, flexible, fast information and traceable links made the development of government apps inevitable. The range of government apps is just as wide as the commercial sector, for example, "Sorting out Separation", the app from the Department of Work and Pensions (Family Law Week, 2012) created to give free advice to couples going through divorce and the Tax Calculator app produced by the Treasury which helps people to work out the amount they owe the government (Sparrow, 2012). The UK government has also used apps to collate information on the population, such as employment statistics and job vacancy figures (Robinson, 2012). Apps as a means to provide paperless transactions have also been highly appealing to governments, in Telangana, India, an m-Wallet app was launched and was used to store over 180,000 driving licences, 242,000 registration certificates and to register over 283,000 vehicles in under a month (Ujaley, 2016). In many remote parts of the world, Wi-Fi has proven to be an efficient way of communicating with the population (Mint, 2014). Just like any commercial enterprise, government apps need to be updated regularly to keep them relevant to their audience (Marks, 2011). The most pressing problem governments face lies in protecting their data, therefore government apps have to be equipped with appropriate levels of protection to safeguard them from cyber attacks, not only by private individuals but, more worryingly, from other government-sponsored sources. Ever since Snowden highlighted the problems of an individual with access releasing sensitive data, security and encryption have been major concerns. Some governments have also taken an interest in providing certified apps through approved government app stores (Computer Business Week, 2011, Gulf News, 2014).

2.5 App Provision in Libraries

While the adoption of the internet and the provision of access to it has been at the forefront of public library services, the same cannot be said of mobile technology and app provision. Taking into account that the provision of an app has been linked to peoples' positive perception of a service and general contentment (Linnhoff and Smith, 2016), it would be beneficial to libraries to provide such a service to a population increasingly working mobile technology into their lives (Barkhuus and Polichar, 2011). Academic and specialist libraries, with inbuilt clientele, were the first to investigate the service demands for apps (Ballard and Blaine, 2013), backed up with survey results on app usage (Liu and Briggs, 2015). It would not be unreasonable to assume that the same preferences shown in these studies would be reflected by the general public, namely to be able to (in order of popularity):

1) Search the catalogue
2) Acquire library contact information
3) Search databases
4) Renew book loans
5) Get access to patron accounts
6) Order inter-library loans

Other services which could be included in a public library app include access to e-books, e-audio, music and video, marketing for both local and library events, perhaps through a calendar function and links to government, health and other services (Ashford and Alex, 2013) and a self-check-out system, potentially based on radio-frequency identification (RFID) technology (Ong et al., 2014). This not only has the potential to streamline the user experience but would also have implications on financial saving and out-of-hours access. An important aspect of any app is the ability to assess its usage. Basic statistics which can be monitored include hit counts on each service, download numbers and the duration of visits. Identifying the type of devices used to access library services can be used to tailor services. Another facet to consider is the potential for the library as a platform for third party apps. Hennig's book suggests a multitude of possible apps for consideration covering apps for reading, productivity, referencing, notes and writing, multimedia, content creation and curation, special collections and professional development (Hennig, 2014). This, however, raises a series of other questions:

1) Should the library be promoting commercial products, even free ones?
2) Should the library promote fee-based apps and if so, who pays for it, the patron or the library?
3) If the library provides access to apps, where can patrons access these from and how many patrons can access the app at once? Only on library premises, only on library devices or anywhere on the patrons own device?
4) Who is responsible for security? The library service itself may be secure but as soon as a third party gets involved there is potential for vulnerabilities in security. Is it worth risking the trust of the public?

A final consideration is whether to programme the app in-house or to employ an app developer. The former requires a full-time specialist to monitor and update the service while the latter requires the payment of fees and relinquishes control of the app to a third party.

2.6 Evolution of Expectations

The first smartphones started to become increasingly common about 2008 (the first smartphone was released in the US on the 29th of June, 2007 (Apple Press Info, 2007)). At this time they had narrow bandwidth, slow download speeds and a high charge for handling data. This all helped define what the early users expected in way of services. Among the earliest surveys conducted was a UK study by Mills of Cambridge University and Open University staff and students (Mills, 2009). Her study was principally to ascertain the habits of mobile phone users. Her results showed: "The majority of respondents primarily use their phones to make calls, send text messages and take photographs" (Mills, 2009, p.3) with a significant number using or interested in text alert/notification and SMS reference services. The results also showed that, on average between the institutions, only 20% of respondents accessed the internet more than once per week using their mobile phone. There was an interest shown in the possibility of using mobile technology to check on library services such as opening hours and the catalogue. The activities done using a mobile phone make an interesting comparison with the user today. As reported in Table 2, in 2010, on average between Cambridge and Open University respondents, the following services were never used on mobile devices: read an e-book (93%), read a journal article (88%), listen to audio (80%), watch video (65%), listen to music (58%) or view photos (35%).

Table 2 – Average percentage of respondents who have never used a service on their mobile.

Non-activity	Percentage (%)
Read an e-book	93
Read a journal article	88
Listen to a podcast/audio-book	80
Watch videos	65
Listen to music	58
View photos	35

Mills noted that: "iPhone users are already more inclined to read eBooks on their phones, according to comments from the respondents to this survey." (Mills, 2009, p.3) This report came at the point just as the changeover between mobile phones with small screens, primarily used for making calls and sending texts, and larger, thinner, mobile phones with touchscreens and a wider range of functionality was beginning to take shape.

In 2013, a yes/no questionnaire survey conducted by Kumar asked students for their opinions on mobile technologies as supplied by the libraries at Jawaharlal Nehru University (Kumar, 2014). He noted that mobile/smartphone technology had been taken up by over 90% of survey respondents. The majority accepted that mobile technology had become very important, in fact 82% of respondents said that they could survive without food for a day but not their phone, more than 70% of students kept their mobile with them at all times and more than half of students could not imagine life without a mobile phone. The vast majority were willing to be contacted by the library via their mobile. Over 80% of respondents would like to be able to search the library catalogue using their mobile. This agrees with Mills finding from 2009. Students prioritised information services as follows in Table 3:

Table 3 – Student Service Priorities

Service	% of students who prioritise the service
Links to the library catalogue	78
Book reservations	75
Programmes, events, new editions and library news	70
Downloadable e-books, e-journals and articles	66
Bookable library training sessions	63
Reminders	59
e-books, e-articles and e-reviews	57
Feedback	34
Pay fines	30
Book locations	23
Any other	5

It was also found that almost 100% of students thought that the use of mobile technology would increase their access to the library, make library resources more usable and improve the quality of the libraries services. 100% of respondents now expected the library to be able to provide its services through mobile devices. This reflects the increased sophistication of user standards and the wider uptake of mobile technology by society.

Becker et al surveyed students from Hunter College, New York, to ascertain ownership levels and student usage patterns of mobile devices (Becker et al., 2013). They used this information to determine the services which would be most appropriate for a mobile library website. As Kumar found in New Delhi at around the same time, well over 90% of the students surveyed owned a mobile. She continued to point out that these devices were split between different operating systems: Apple iOS 30%, Android 27%, Blackberry 17% and 20% which were not internet enabled. At this time it was found that 74% of respondents accessed the internet wirelessly on their laptop, compared to 47% through their phone. When questioned on where they used their mobile phones when accessing the web, the most popular responses were “school” and “out”, at approximately 75%, followed by “ “home” and “commuting”, both slightly above 60%. Students said that the services they would like available most on their mobile were the ability to search the libraries databases, search the catalogue, reserve books and access e-books, in that order. 21% of respondents indicated that they owned a tablet device, however a further 38% stated that they intended to acquire one in the near future, this illustrated the importance of making the library website viewable across a wide range of platforms and screen sizes. 58% of students stated an interest in having a text reference service. Overall, students were shown to be increasingly using mobile devices for educational purposes, not just to socialise.

Canuel and Crichton examined the provision of third-party apps by libraries in the Association of Universities and Colleges of Canada (AUCC) (Canuel and Crichton, 2015). They found that 37% of libraries had links to external mobile apps and of these, 42% had a dedicated app guide and the remainder had subject-specific app guides. Some guides were organised by operating system and others by discipline e.g. healthcare, business or education. They noted that the more research orientated the institution, the more likely the library was to include apps.

The most frequently occurring app categories were:

- Reading apps (69%)
- Citation management (50%)
- Bibliographic databases (42%)
- Cloud-based (28%)

Since many of these apps came bundled with their subscription, the promotion of these apps is simply getting the most out of a resource. Cloud-based apps included Google Drive, Dropbox and Evernote. By using the cloud for data storage, users can take advantage of the mobile nature of apps. The presence of cloud-based functionality indicated the continuing trend towards Web 3.0 and Library 3.0 in practice. All libraries catered for iOS devices, 95% for Android, 39% for Blackberry and 25% for Windows. This shows an attempt by the libraries to provide for all operating systems and not just for the most common platform. The majority of apps were either free or had been subscribed to by the institution. The small number of subscription apps which patrons needed to pay for were highly specialised for professionals, particularly for medical and law faculties. Apps which were considered to be potentially useful were sometimes advertised on library websites. Libraries have a history of exposing their communities to new technologies for example by allowing public access to the internet before it was widespread and the introduction of makerspaces and 3-D printing. As the Web has metamorphosed through its various stages, 1.0 – 3.0+, and communications technology has matured from 2G to 4G and beyond, so libraries have shown themselves capable of adapting to new technological environments, taking their services online and reaching out to patrons beyond the physical space of the library buildings. The next stage in this evolutionary process is the realisation that the general public now take it for granted that services are available through smart technology and that library services must therefore provide a basic library app, at the very least. However as technology further evolves, this will not be sufficient, dialogue via social media and access to rich external information sources will soon be a minimum public expectation. With authorities questioning the necessity of libraries, the library needs to step-forth once again in its role as a trusted information source and community educator to enable the population to make full use of the potential of self-publication, creation 3D and virtual-reality technology. As access to these services has to be known to the public and smart technology continues to be increasingly available, apps will provide the ideal gateway to the library for many.

3.0 Methodology

The aim of research is to attempt to decrease uncertainty and provide a degree of knowledge about a subject. In this instance there has been no previous research in this area which is known to the researcher, so the degree of uncertainty is high. There is no historical data with which to compare the results hence a range of answers has to be permitted hopefully to reveal some unanimity. In a similar situation, in the context of the health service, Sofaer argued for the use of qualitative methods as follows:

Qualitative methods are also very useful in enquiries into developmental and historical processes within institutions, communities, and markets. One of the great advantages of qualitative methods is that they enhance the capacity not only to describe events but to understand how and why the 'same' events are often interpreted in a different, sometimes even conflicting manner, by different stakeholders. (Sofaer, 1999)

In this case, the aim of the research was to ascertain the extent to which apps had been introduced into the Scottish Public Library Service. Since this is the responsibility of the Local Authorities, one part of the research was directed specifically at the Local Authorities. In parallel with this, the opinion of the general public was sought, to attempt to identify either the success of app implementation or the degree of demand for such a service. The overall scheme was to obtain relevant data from the Authorities and the public, collate the data and by means of statistical analysis of ordinal responses and content analysis of textual responses, derive and impression of the current state of public library apps within Scotland.

3.1 Data Collection

Having considered various possible methods for gathering data such as group workshops, collating existing data and face-to-face interviews, it was concluded that the only feasible way to gather the required information from over the target area within the time-scale of the dissertation was by electronic survey, to be distributed digitally by email and through social media channels. The principal advantages of this method are:

1) Allows for instant distribution across a physical area
2) Multiple online surveys can be run simultaneously
3) Feedback and queries can quickly be responded to
4) It is the most economical an eco-friendly method of distribution
5) Simple to set up with the appropriate software
6) Can accommodate a variety of question types e.g. single or multiple, numeric or text responses
7) Customised question wording or fills such as drop-down checklists
8) Can easily skip questions which don't apply to the respondent, reducing response error
9) Can run edit or data validation checks
10) It is possible to make questions mandatory, so key data is entered
11) It is possible to include other forms of media in the questionnaire, e.g. video
12) Responses are stored automatically, making them harder to lose

This method was the only viable means of collecting a sufficient amount of data from across the nation and still leave enough time for analysis within the timeframe of the dissertation. There are, however, some drawbacks to this method. In common with other modes of data collection, there are coverage problems, in this instance due to the non-uniform internet provision across the country. It is easier to ignore an online survey than a face-to-face request. There is no control over how the libraries promote the public survey to their patrons other than requests for promotion on social media and by printing posters, which could be ignore. There is also very little control over the number of responses, who responds to the survey or how often they respond, all of which could potentially spoil the survey results. It requires an initial positive action from the respondent in order to complete the survey of their own accord. The target audience is restricted by the digital nature of the survey and is less likely to get responses from individuals who are less comfortable with technology. Therefore, as the respondents are entirely self-selecting, the ways in which the collected data can be analysed and interpreted are more limited.

The online survey tool Qualtrics was used for the creation, distribution and initial analysis of the surveys. It was chosen because the researcher was familiar with this tool from previous experience. Two surveys were created. The first was aimed at the authorities themselves with the purpose of determining the presence of an app and to investigate the factors influencing whether or not to implement an app. The second survey was targeted at the public in order to ascertain the level of

awareness of library apps, the public appetite for a library app and what services would be expected from such a facility.

3.2 Survey Design

Previous examples of the use of surveys to obtain similar types of information were examined for their range and suitability of use (Kumar, 2014, Canuel and Crichton, 2015, Becker et al., 2013, Mills, 2009). This helped in deciding on the most suitable format for the questions, to indicate the type of questions to ask and were useful as guides on survey length and number of questions. In designing the surveys, care was taken to ensure that the questions remained focused. To preserve anonymity, the questions were asked in such a fashion as to not identify individuals. For example: no names and no addresses were required and there was an opt out option on any question relating to personal information, for example age range and gender. The only compulsory response required was to identify which local authority the respondent was associated with; this was true for both surveys. Questions with a scaled range of answers always had an odd number of potential answers to ensure that a neutral choice was always available. The Likert scale was used for many of the questions as it allows for a neutral and nuanced response from the respondent. Both surveys ask if the respondent has any other opinions or thoughts they would like to express via a textbox.

The Authorities Survey was designed such that authorities with no app were directed down a different line of questions from those that had an app already released or in development. Similarly, members of the public whose local authority did not have a library app available or were unaware of the existence of a library app were posed a different series of questions from respondents who had access to and knowledge of a library app.

Bethlehem's book gives pointers on questionnaire design (Bethlehem, 2009). He advises that the following should be avoided: indefinite words, ambiguous or double-barrelled questions, questions necessitating memory recall, long question text, leading questions, negative and double-negative questions and hypothetical questions. He emphasises the importance that question text uses common language and non-technical term whenever possible.

With regard to question and answer types, textboxes are useful in that they encourage spontaneous response in the respondents own words, though this makes analysis more complicated and thus should be generally avoided. With restricted choice in closed questions, he indicated that "Other"

and “Don’t know” options should be included to allow for a full range of responses and encourage the respondent to complete the questionnaire rather than leaving blank answers. Filter questions can be used to facilitate different pathways through the survey, thus avoiding respondents being asked irrelevant questions. Care should be taken when displaying answer options as a list, as there is a bias for respondents to choose from what they initially see rather than scrolling to other choices. Hence the use of a drop-down is preferable to a long list. Thought should be given to question order, with topics grouped together, easily answerable factual questions at the start of the survey to encourage the respondent and more complex or opinion questions towards the end. Though not mentioned, a self-selecting survey should not be overly long, therefore the public survey was kept short in order to promote its completion.

The initial drafts of the Authorities Survey and the Public Library App Survey were written by the researcher. These were examined by the dissertation supervisor before being submitted for approval by the departmental ethics committee. They were returned with suggestions for modification and obtained approval from the ethics committee upon second submission, having had the requested alterations made. Both surveys were opened to responses on July the 2nd 2016. Response to the Authorities Survey was by invitation only. Both surveys were pre-tested before their release to ensure that the possible pathways through the questionnaire were valid and worked as intended. Despite the pre-test, the question flow of the Public Library App Survey required an edit during the running of the survey.

3.3 Recruitment

An email was sent to each council or library service within Scotland to request a contact person within the library service relating to app services. If no response was received within a fortnight of the initial contact request, a second email was sent requesting the same. If there was still no response within a fortnight of the second contact request, the library services in question were called in order to obtain contact details. As contact details were received, each was sent an introductory email explaining the purpose of the study and requesting that they fill in the Authorities Survey (see Appendix 1) regarding public library apps. A second email was then sent which contained a link to the Public Library App Survey (see Appendix 2), a printable poster advertising the public survey (see Appendix 3) and a request for the public survey to be advertised through the library services social media networks. In order for the results to be as valid and useful as possible, it would be ideal if all of the authorities responded to the Authorities App Survey and equally, for the

Public Library App Survey results to be as representative as possible, a reasonable public response is required.

3.4 Data Analysis

The methods selected for data analysis were the Mann-Whitney U Test (Nachar, 2008) and content analysis (Hsieh and Shannon, 2005).

3.4.1 Mann-Whitney

Since the data is not conducive to treatment by parametric methods as it does not follow any standard distribution, a nonparametric test was employed. The Mann-Whitney U Test was deemed to be appropriate for this purpose, mainly because it makes no assumptions relating to distribution. However some assumptions are implicit.

1) The sample drawn from the population is random
2) Independence within the sample group and mutual independence between sample groups
3) An ordinal measurement scale is used

The first assumption will be the weakest as some librarians may have also responded to the public survey, which could lead to more extreme views being expressed as they might be strongly in favour or against library apps due to past experience. The Mann-Whitney U Test is sufficiently robust to be able to accommodate this. The second assumption should be valid and for the third assumption, the Likert scale questions were converted to ordinal scales with the most positive response having the highest value and the most negative response, the lowest. The probability was obtained from correlation tables using a 0.05 two-tailed test to obtain the critical statistical test value, by comparing this with the lowest U value from the samples, it should be possible to determine the validity of the null hypothesis. In this case, the null hypothesis was that the two populations would be the same. An example of the Mann-Whitney U Test in practice is shown below, comparing questions three and four of the Scottish Authorities Survey, each with thirty-three responses.

The H_0 hypothesis is that there is no significant difference between these populations and H_1 is that there is a significant difference between these two populations.
The significance test will be for a two-tailed test with $P_\alpha = 0.05$.

Table 4 – Mann-Whitney U Test Comparing Age Range And App Provision From Authorities App Survey

Stage	Result 1	Result 2	Result 3	Result 4	Result 5	Result 6	Result 7	Total
Q3 Data	0	2	4	9	14	1	3	33
Q4 Data	13	5	2	13				33
Q3 %	0.00	6.06	12.12	27.27	42.42	3.03	9.09	100.00
Q4 %	39.39	15.15	6.06	39.39				100.00
R_3	1	3.5	6	8	11	2	5	36.5
R_4	9.5	7	3.5	9.5				29.5

$U = \sum R - 0.5(n*(n+1))$ where $\sum R$ is the lower rank value from the samples and n is the number of samples in that population.

As R4 < R3, R4 will be used in the Mann-Whitney U Test.

Therefore: $U = 29.5 – 0.5(4*5)$, $U = 29.5 – 10$, $U = 19.5$

From a two-tailed test table with $P_\alpha = 0.05$, the critical test value is 3.

Since $19.5 > 3$, the H_0 hypothesis is accepted, i.e. there is no significant difference between the age range and the provision of a library app. This means that there is no bias between the age of the Authority and whether there is an app or not.

All of the Mann-Whitney U Test calculations were performed using the same method as demonstrated above.

3.4.2 Content Analysis

Content analysis is a qualitative technique used particularly in research when responses are allowed to be varied and unrestricted in length or control. It is often used in situations where respondents in a similar situation will have distinctive reactions, memories or opinions. It is often used in market research, health services and mass communications. The current research fits in with these categories. There are several styles of content analysis: conventional content analysis depends solely on the responses presented, directed analysis presupposes some theory or concept around which the responses are compared and summative analysis looks for key word frequency and their content. While several of the questions in the surveys had specified options, most had some variety of an “Other (please specify)” choice and therefore could be regarded as being reasonably open-ended. Since there was no relevant literature to compare the responses to directed content analysis was not possible and since the worst majority of textual response were very concise, the summative approach was not viable. Hence the conventional content analysis approach was adopted.

The main principle of content analysis is to thoroughly read through the textual content in order to identify themes emerging from the text. Consequently identifying categories and identifying key

concepts and labelling these categories. Relationships between them are established where appropriate. An examination of the frequencies of responses in the various categories gives an indication of its importance. For example, in the public survey this applied to the response to questions ten for app users and fourteen for the entire sample population and to question seven in the Authorities Survey. The categories from each question can each be grouped into a hierarchical schematic to illustrate the related categories and their relative importance. For example, categories initially identified in Public Survey question fourteen included:

search capability, catalogue access, book reservation, loan renewal, e-book access, e-magazine access, content accessibility, account information, general library information, organisation links, events, requests and miscellaneous.

Subsequently, search capability and catalogue access were merged. New stock was removed from miscellaneous and placed under the category of library collection. E-books and e-magazines were merged with e-audio from miscellaneous to form the category e-materials. The categories were then grouped into themes and put into a hierarchy:

- core services – library collection, reserve books, new stock, requests
- management – account information, accessibility, organisation links
- e-materials – e-books, e-magazines, e-audio
- events – library, local
- general information
- miscellaneous

For the purposes of analysis, comments such as “Don’t know” were placed under miscellaneous. The hierarchy can be seen in Appendix 4 and the breakdown can be seen in the Results section. Some comments referenced more than one key theme, hence the total frequency adds up to more than the total number of comments in some cases.

One of the main problems with context analysis is validity and reliability. Often this is addressed by having more than one person analyse the text data and agreement on categorisation is arrived at by mutual consent. Since this study was done by a single researcher, this problem was addressed on a more ad hoc basis by asking the opinion of others.

As an addendum, Authorities with an app were asked to share any data they may have collected on app usage. No close analysis was performed on this data; it was used simply as anecdotal evidence of historic library app use.

4.0 Results

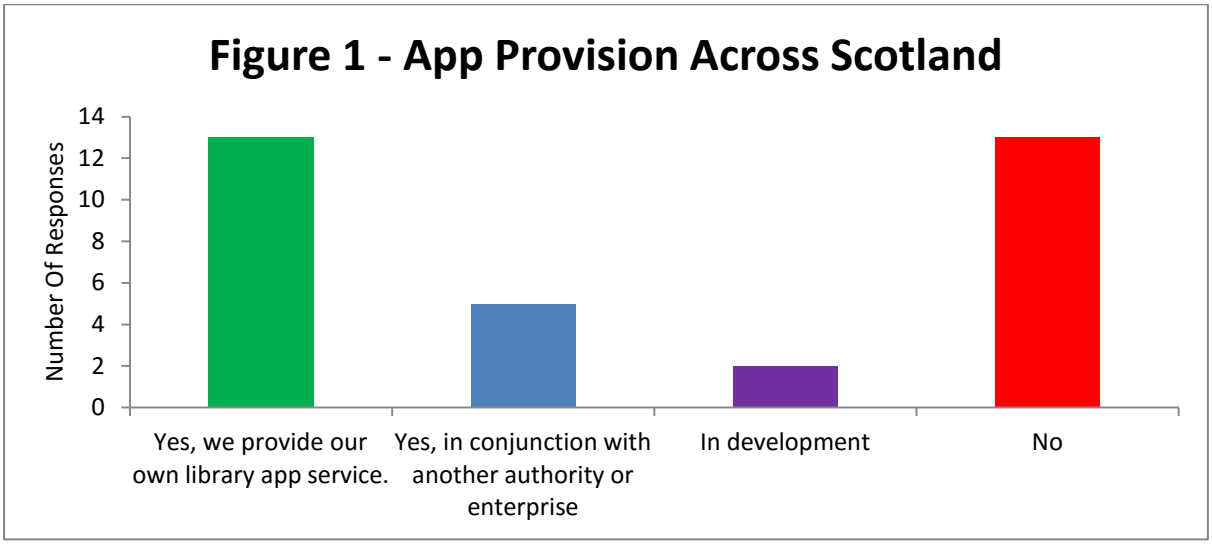
4.1 The Scottish Authorities Survey

Of the thirty-two Scottish Local Authorities contacted, thirty-three responses were returned. One Authority returned two responses and one Authority only gave a partial response and was therefore only valid for parts of the survey, where it has been included. Therefore a total of thirty-two complete valid survey responses were received over a period of two months, hence the response can be considered to be a true basis for reflecting the current view of the Authorities in Scotland.

Question four simply determined whether the Authority in question provides a library app service, is developing an app or does not have an app. Results are shown in Table 5 and Figure 1 and further illustrated in Figure 2.

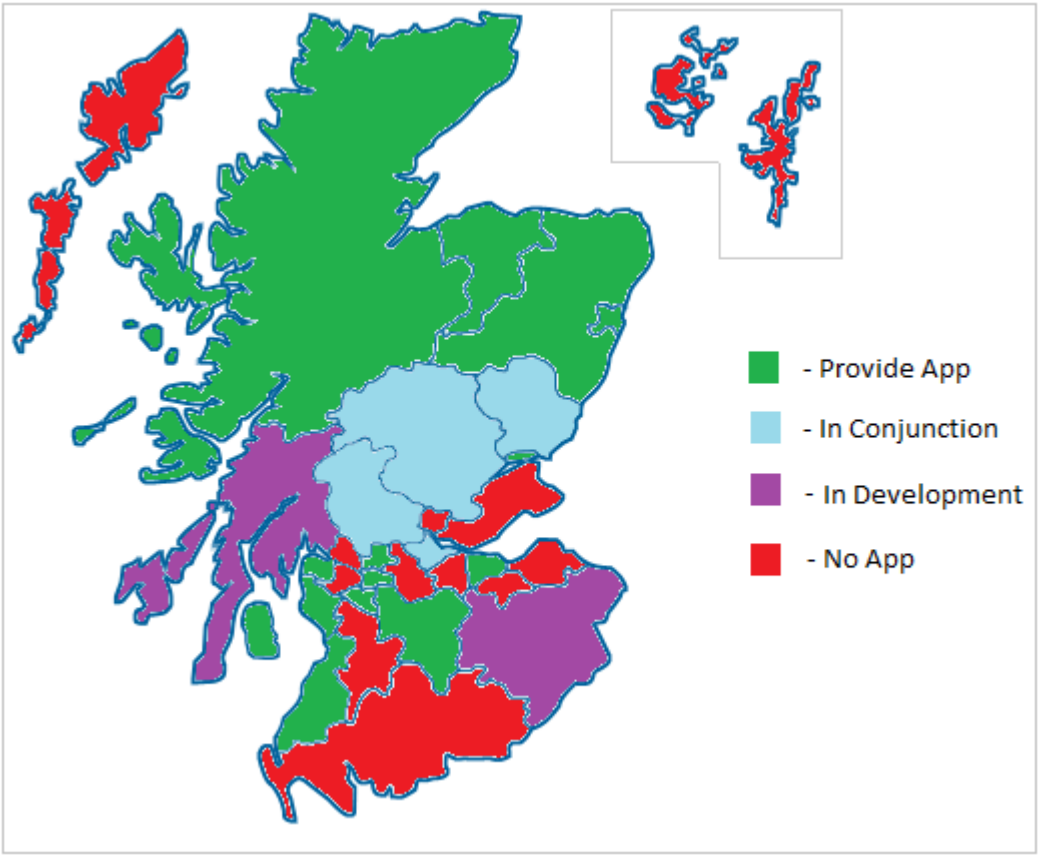
Table 5 – Do you provide a library app service?

App Provision	Number Of Responses	Percentage (%)
Yes, we provide our own library app service.	13	39.4
Yes, in conjunction with another authority or enterprise	5	15.2
In development	2	6.1
No	13	39.4



As seen in Table 4, there are thirteen Authorities which provide their own app, five which provide an app service in conjunction with another Authority or enterprise, two Authorities have an app in production and thirteen Authorities have no app service.

Figure 2 – Geographical Spread of Library App Provision

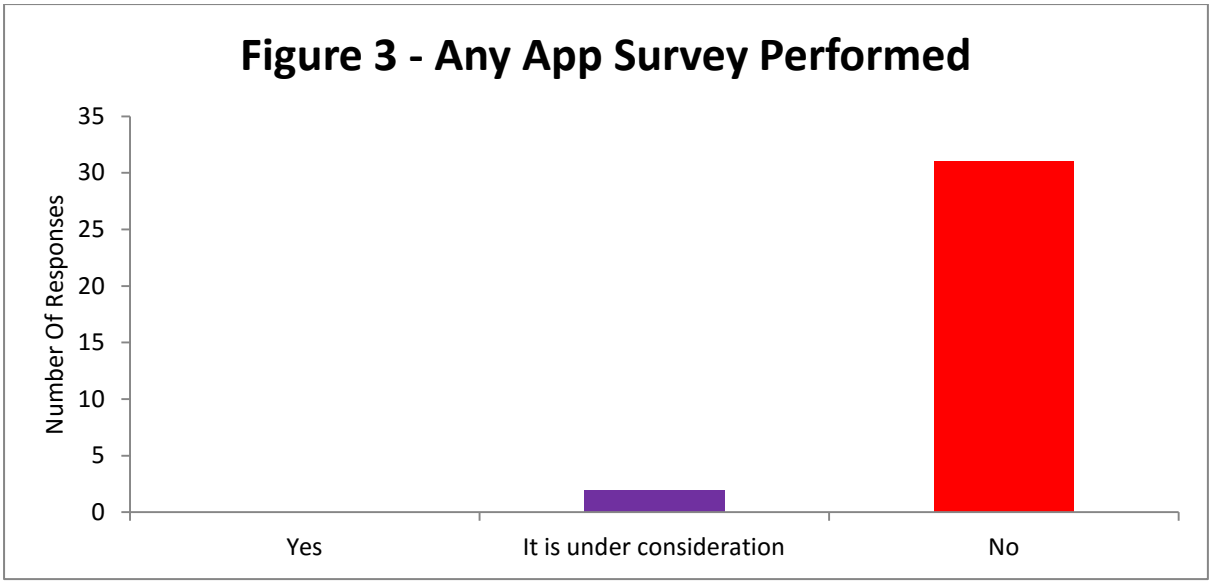


The four Authorities which operate in conjunction with a supplier are geographically close to each other but do not work in conjunction with each other. Otherwise, all of the main cities have app provision though generally there appears to be no connection between population density and app provision or between internet accessibility and app provision.

Question five asked if any previous surveys had been conducted regarding library apps. None of the Authorities had previously run a survey or questionnaire on the potential provision of an app within their area, what the public attitude towards library apps might be nor on what services would be considered as useful from such an app. Two authorities did state that a survey was under consideration. Results are shown in Table 6 and Figure 3.

Table 6 – Has there ever been a survey or questionnaire about the potential for or reception of library app services in your area?

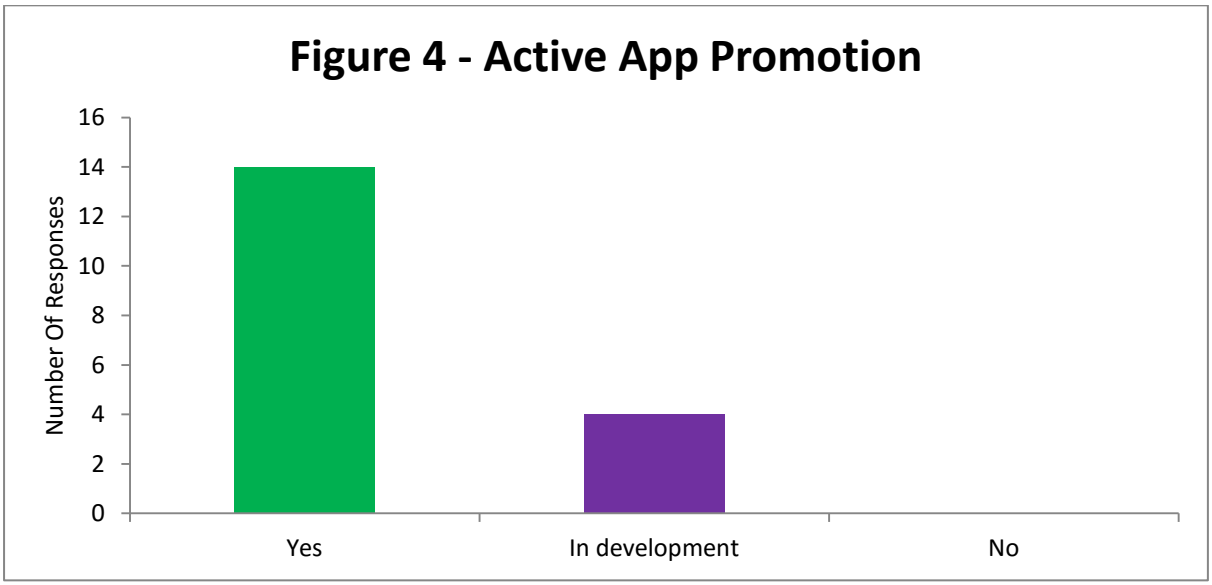
Any App Survey Performed	Number of Responses	Percentage (%)
Yes	0	0.0
It is Under Consideration	2	6.1
No	31	93.9



Question six investigated the state of app promotion within the Authorities. Of the nineteen areas with an app service, fourteen responded that they actively promoted their app, four said that this process was in development, no authority said that they did not and did not intend to promote their app and one authority did not respond. Results can be seen in Table 7 and Figure 4.

Table 7 – Do You Actively Promote Your App Service?

App Promotion	Number Of Responses	Percentage (%)
Yes	14	77.8
In Development	4	22.2
No	0	0.0



From analysing the text answers from the respondents who answered “yes” to question six, the following key phrases were identified:

staff, library website, OPAC, social media, demonstrations, posters, leaflets, staff training, public ICT classes, digital signage, events, council website, e-mails, word-of-mouth, welcome pack, online joining information, blog, banners, drop-in sessions, advertising and no.

The frequency of these key phrases can be seen in Table 8 below.

Table 8 – Frequency of Key Phrases in Authority App Survey Question Six

Key Phrase	Frequency
Library Website	9
Social Media	7
Posters	5
Leaflets	3
Banners	2
E-mails	2
Advertising	1
Blog	1
Council Website	1
Demonstrations	1
Digital Signage	1
Drop-in Sessions	1
Events	1
No	1
Online Joining Information	1
OPAC	1
Public ICT Classes	1
Staff	1
Staff Training	1
Welcome Pack	1
Word-of-mouth	1

By examining the frequency which these key phrases appeared, a series of themes emerged, shown in Table 9, these were:

website, social media, hard advertising, soft advertising, events and staff awareness.

Table 9 – Frequency Of Themes In Authorities App Survey Question Six

Theme	Frequency
Library Website	9
Social Media	7
Hard Advertising	9
Soft Advertising	7
Events	5
Staff Awareness	2

The hierarchy can be seen as Appendix 5.

In question seven, the thirteen authorities without an app were asked to highlight the main reasons behind the decision not to implement a library app service at this time. Respondents could choose as many options as they considered to be applicable to their authority. All thirteen of the authorities without an app service responded to this question and the results can be seen in Table 10.

Table 10 – What reason(s) influenced the decision regarding provision of a library app service? (choose as many as apply)

Influencing Factor	Number Of Responses	Percentage (%)
Budget Constraints	7	53.8
Deemed To Be Low Priority	7	53.8
Waiting To See The Uptake/results From Other Authorities	5	38.5
Other	4	30.8
Insufficient Staff To Facilitate Record Updates To A Suitable Format For App Development	2	15.4
Policy Decision	1	7.7
Rate Of Change In Technology Too Fast	1	7.7
Lack Of Staff Training	0	0.0
Staff Reticence	0	0.0

For question eight, of the two Authorities with an app in development, one said that they expected their app to be available by September 2016 and the other authority expects theirs to be available by the end of 2016.

In question nine the Authorities who provided an app in conjunction with a supplier were asked for the reasons behind for this decision. Respondents could choose as many options as they considered to be applicable to their authority. Two of the five authorities in this category responded to this question. Results can be seen in Table 11.

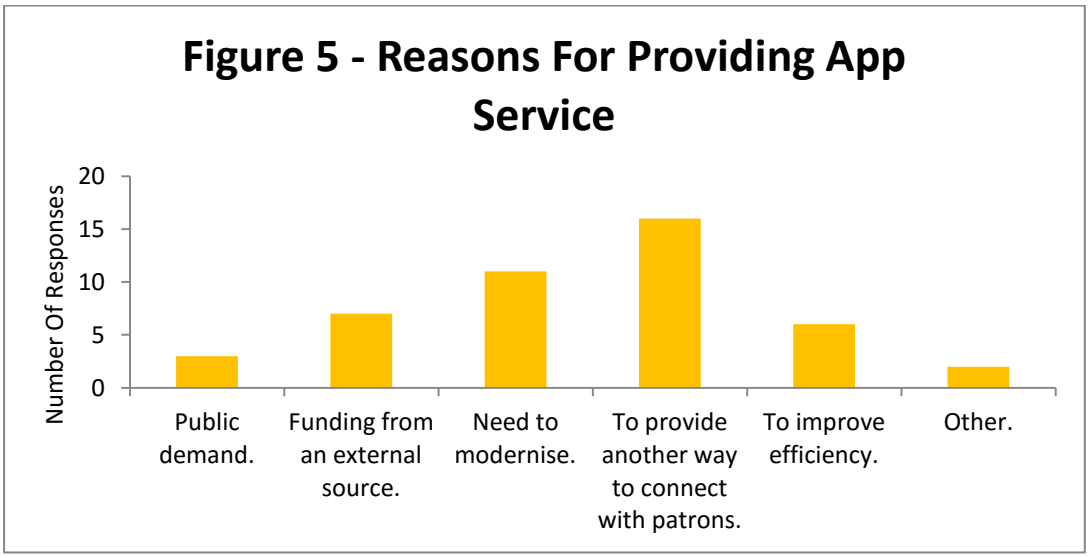
Table 11 – Why was the decision made to operate the library app service in conjunction with another authority? (choose as many as apply)

Influencing Factor	Number Of Responses	Percentage (%)
Other	2	100.0
To Spread Operational Costs	1	50.0
To Pool Staff Expertise	0	0.0
To Better Integrate Library Services Between Authorities	0	0.0
Council Services Normally Provided Jointly	0	0.0

Question ten was for those authorities who provide an app. Respondents could choose as many of the options as they considered to be applicable to their authority. Eighteen of the authorities with an app responded to this question, one did not. The results are as displayed in Table 12 and Figure 5.

Table 12 – What factors influenced the decision to provide a library app? (choose as many as apply)

Influencing Factor	Number Of Responses	Percentage (%)
To Provide Another Way To Connect With Patrons	16	88.9
Need To Modernise	11	61.1
Funding From An External Source	7	38.9
To Improve Efficiency	6	33.3
Public Demand	3	16.7
Other	2	11.1



Question eleven was directed at the nineteen Authorities with an app, eighteen responded to the question asking which services they provided through their app. The results can be seen in Table 13. In response to question twelve, seven Authorities indicated that they provided a service through their app which was not featured as an option in question eleven and nine Authorities mentioned

that they would like to provide additional services over and above what is currently provided by their app in question thirteen. Twelve Authorities indicated that they kept a track of app usage statistics.

Table 13 – Does the app allow access to, information on or link to:

Feature	Yes	Percentage (%)	Under Development	Percentage (%)	No	Percentage (%)	Total Response
Library Locations	16	88.9	0	11.1	2	0.0	18
Library Catalogue	16	88.9	0	11.1	2	0.0	18
Reserve/renew Loaned Items	16	88.9	0	11.1	2	0.0	18
Opening Hours	15	88.2	0	11.8	2	0.0	17
Audio-books	14	77.8	2	11.1	2	11.1	18
Social Media	11	73.3	2	13.3	2	13.3	15
Library Events	10	71.4	3	7.1	1	21.4	14
E-books	12	66.7	1	27.8	5	5.6	18
E-magazines	12	66.7	3	16.7	3	16.7	18
E-databases (e.g. CREDO or ProQuest)	10	58.8	4	17.7	3	23.5	17
Local Events	8	57.1	5	7.1	1	35.7	14
Local Heritage	7	43.8	8	6.3	1	50.0	16
DVD/Blu-ray	6	40.0	8	6.7	1	53.3	15
Music	5	35.7	6	21.4	3	42.9	14
Computer Booking	3	23.1	9	7.7	1	69.2	13
Council Services	2	14.3	11	7.1	1	78.6	14
Health Services	1	6.7	13	6.7	1	86.7	15
Other Bodies (e.g. Citizens' Advice)	1	6.7	13	6.7	1	86.7	15
Ask A Librarian Service	0	0.0	11	21.4	3	78.6	14
Inter-regional Loans	0	0.0	12	7.7	1	92.3	13
Room Booking	0	0.0	13	7.1	1	92.9	14
Tutor Booking	0	0.0	13	7.1	1	92.9	14
Government Services	0	0.0	13	7.1	1	92.9	14
National Institutions	0	0.0	13	7.1	1	92.9	14
Recommended Apps	0	00	13	7.1	1	92.9	14

Question fourteen asked whether the Authority kept a record of download/usage figure for their app. Sixteen Authorities replied to this enquiry. Results are as shown in Table 14.

Table 14 – Do you keep a record of download/usage figures for the app?

Response	Number Of Responses	Percentage (%)
Yes	12	75.0
No	4	25.0

Question sixteen asked how the Authorities measured app performance. Sixteen responses were received and ranged from “installs & monthly opens” to “Number of times launched”. The key phrases identified form the “yes” responses to question sixteen were:

- From app supplier
- Number of devices installed
- Length of run time
- App launches
- App in development
- None supplied
- Not measured.

The frequency of these key phrases were as in Table 15.

Table 15 – Frequency of Key Phrases in Authorities App Survey Question Sixteen

Key Phrase	Frequency
App Launches	8
App In Development	4
From App Supplier	3
Number Of Devices Installed	3
Length Of Run Time	1
Not Measured	1
Not Supplied	1

These were collapsed into themes, with frequency shown in Table 16.

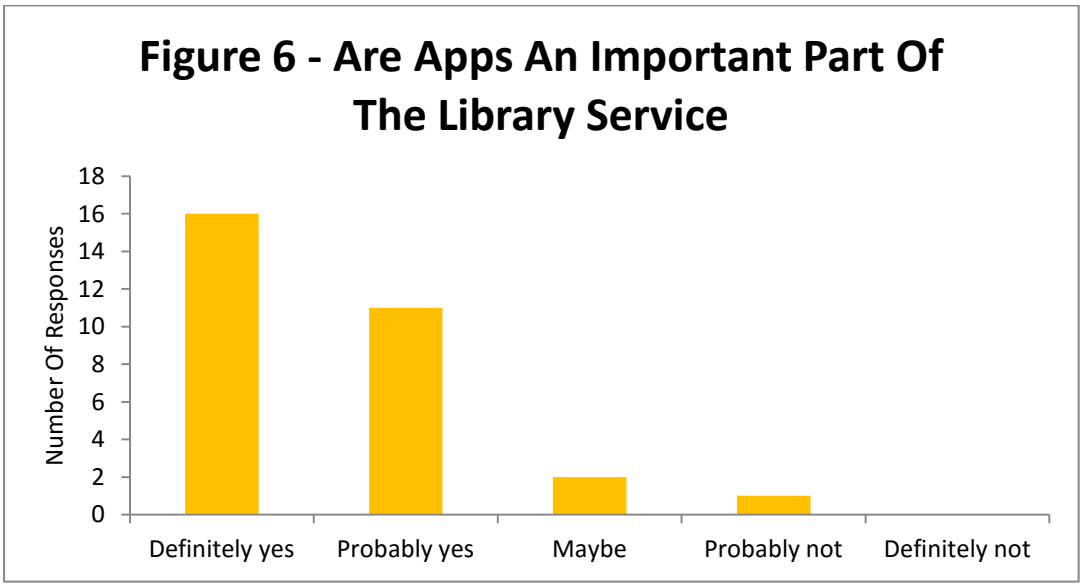
Table 16 – Frequency of Themes in Authorities App Survey Question Sixteen

Theme	Frequency
Statistics Collected	15
Not Yet Collected	4
Statistics Not Collected	2

Question seventeen asked each of the Authorities for their opinion on the importance of a library app service. Thirty responses were received to this question, as shown in Table 17 and Figure 6.

Table 17 – Do/would you consider the library app to be a useful addition to the library service?

Response	Number of Responses	Percentage (%)
Definitely Yes	16	53.3
Probably Yes	11	36.7
Maybe	2	6.7
Probably Not	1	3.3
Definitely Not	0	0.0



Question eighteen asked for any additional comments on library apps, fifteen Authorities replied to this. Their responses include "Our app supplier offers poor support and more could be achieved if service was improved" and "The current library app could be improved to make integration between third party services more streamlined for the user. For example, we are working towards a single sign on for all services via the app". The key phrases identified were:

Funding, borrowbox, e-resources, app development, catalogue access, renew items, LMS suppliers, platforms, poor app functionality, promotion, no, positive feedback and supplier issues.

The comments were generally too diverse for tighter grouping. The frequency of the key phrases is displayed in Table 18 below.

Table 18 – Frequency of Key Phrases from Authorities App Survey Question Eighteen

Key Phrase	Frequency
Poor App Functionality	5
Supplier Issues	3
App Development	3
Promotion	2
LMS Supplier	2
Catalogue Access	2
Funding	1
Borrowbox	1
e-Resources	1
Renew Items	1
Platforms	1
No	1
Positive Feedback	1

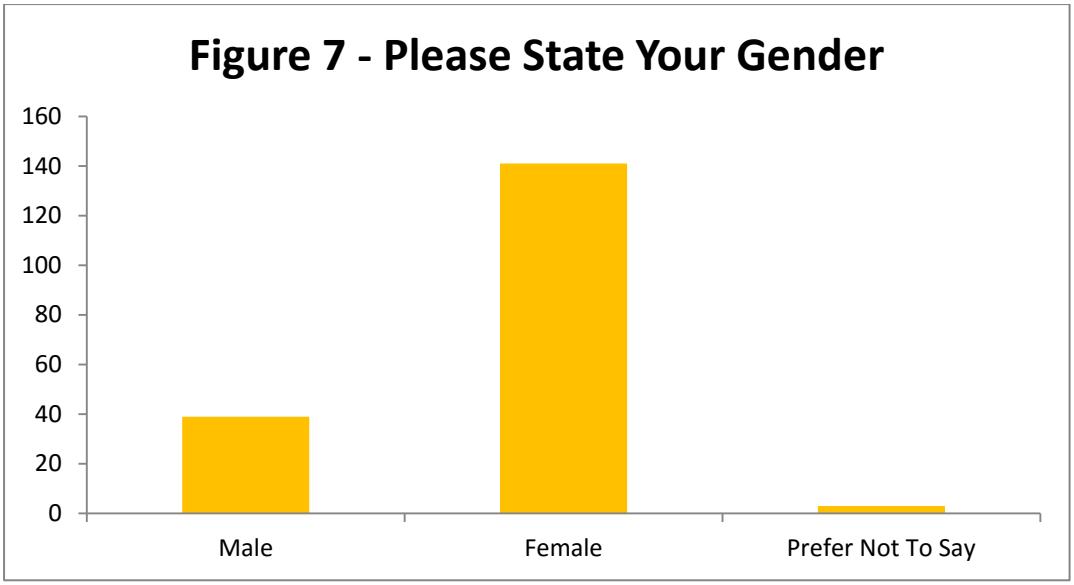
4.2 The Public Library App Survey

The first question was the only compulsory question in the survey and asked the respondent to identify which Local Authority area they are resident in. Public responses were received from almost all areas. Three areas had zero responses, fifteen areas had 1 – 4 responses, ten areas had 5 – 9 responses, one area had 10 – 20 responses and three areas had 20+ responses. The largest response from any one area was twenty-seven.

Question two showed that there was a clear split in the gender distribution of the survey respondents as shown in Table 19 and Figure 7. One hundred and forty-one respondents were female, thirty-nine respondents were male and three preferred to not identify their gender. One hundred and eighty-three responses were therefore received to this question in total with two respondents not leaving an answer to the question.

Table 19 – Please State Your Gender

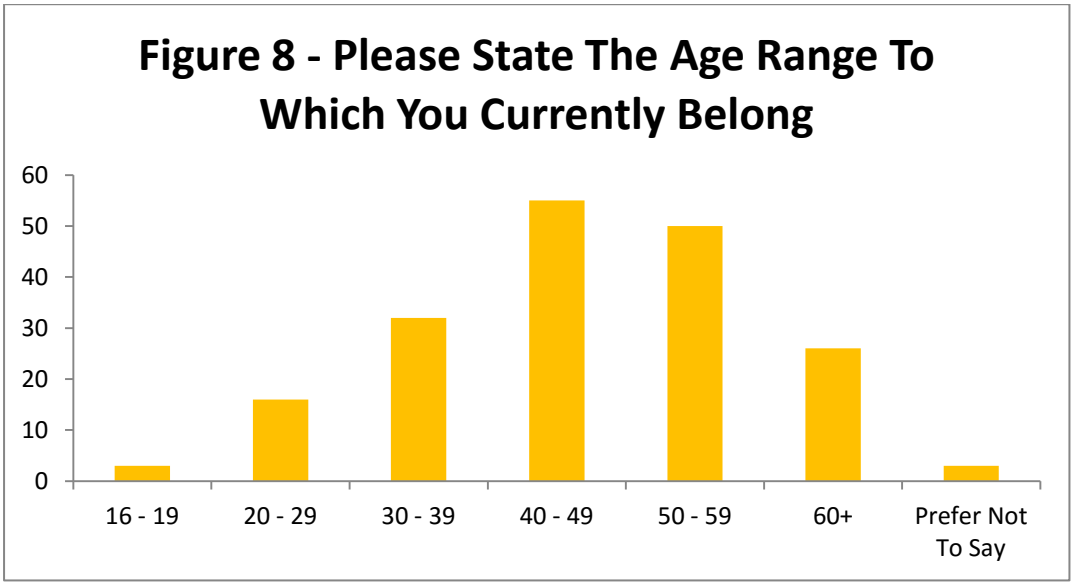
Response	Number Of Responses	Percentage (%)
Male	39	21.31
Female	141	77.05
Prefer Not To Say	3	1.64



Question three asked the respondent to indicate their approximate age. The age ranges collected extend from 16 – 19 at the youngest to 60+ at the oldest. All of the respondents replied to this question. The results are displayed in Table 20 and Figure 8.

Table 20 – Please State the Age Range to Which You Currently Belong

Response	Number Of Responses	Percentage (%)
16 - 19	3	1.62
20 - 29	16	8.65
30 - 39	32	17.3
40 - 49	55	29.73
50 - 59	50	27.03
60+	26	14.05
Prefer Not To Say	3	1.62



To check the validity of the public respondents as representatives of the general public, a Mann-Whitney U Test was applied to compare question three with the national register as of 2014 (Team, 2016). With H_0 being that there is no significant difference between the populations and H_1 that there is a significant difference between the populations. The results from this were as follows:

$\sum R_{(national\ register)} = 30$

$\sum R_{(survey)} = 25$

$\sum R = 25$

$U = 10$

$P_\alpha = 2$

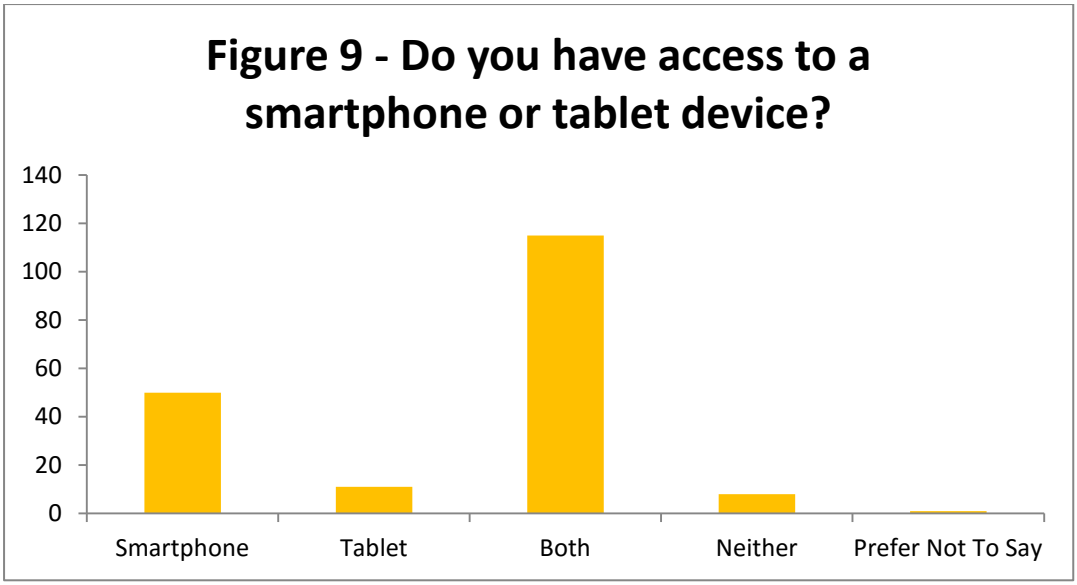
$U > P_\alpha$

Therefore H_0 was accepted and it was concluded that the sample population was not significantly different from the general population and it is not unreasonable to accept the opinion of the sample as a reflection of the opinion of the general population.

Question four was on device ownership. Respondents were asked if they had access to a smartphone or tablet. All 185 respondents replied to the question, results can be seen in Table 21 and Figure 9.

Table 21 – Do You Have Access to A Smartphone or Tablet Device?

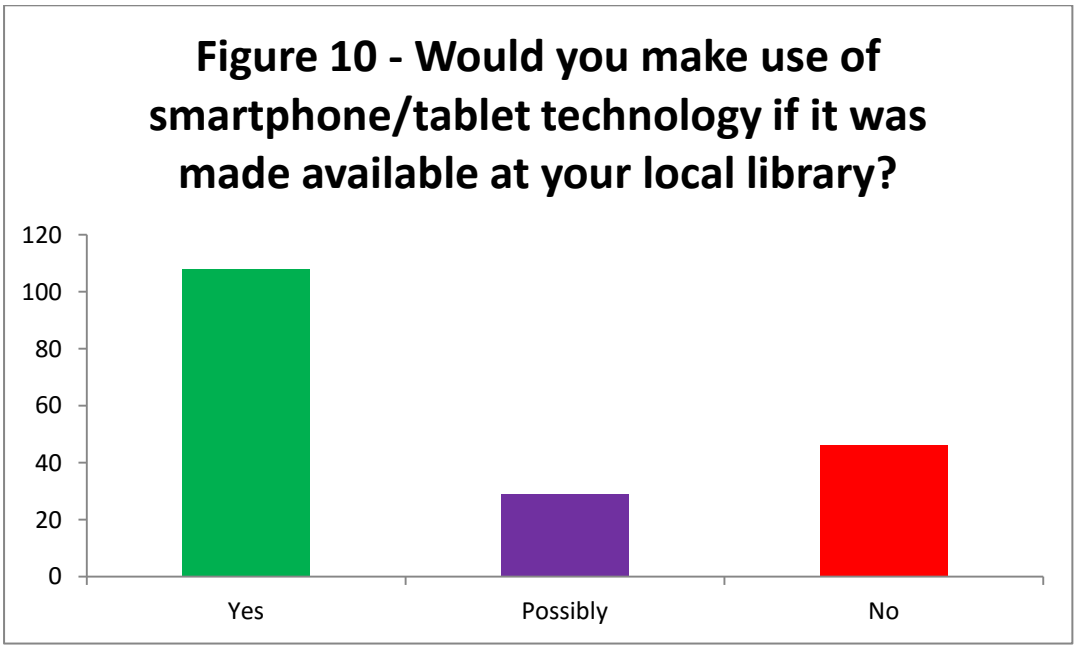
Response	Number Of Responses	Percentage (%)
Smartphone	50	27.03
Tablet	11	5.95
Both	115	62.16
Neither	8	4.32
Prefer Not To Say	1	0.54



Question five asked whether the respondent would use a smartphone or tablet if they were available from the library. One hundred and eighty-three responses were received, two respondents did not answer this question. Results are displayed in Table 22 and Figure 10.

Table 22 – Would you make use of smartphone/tablet technology if it was made available at your local library?

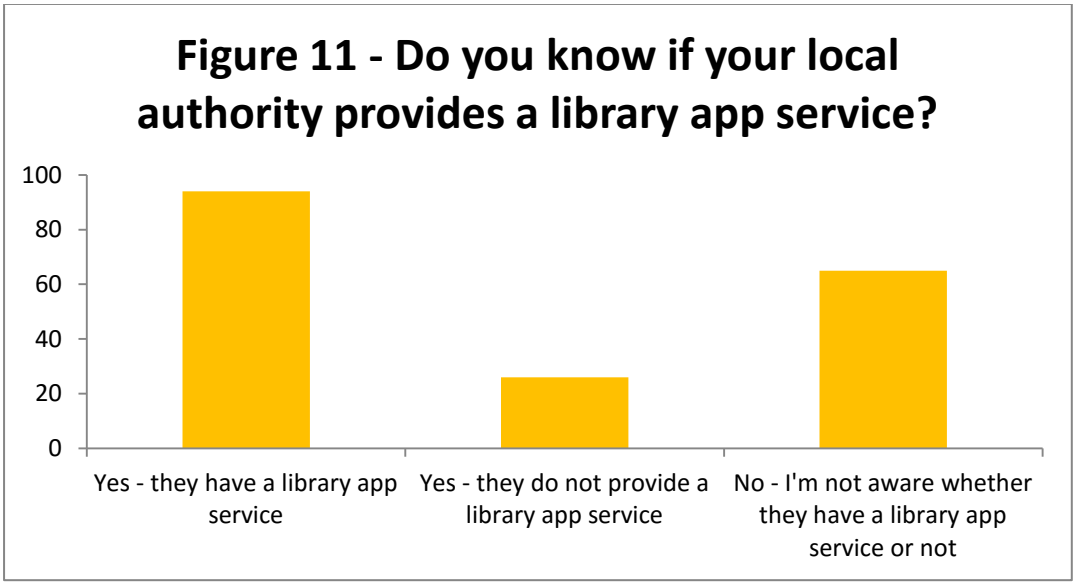
Response	Number Of Responses	Percentage (%)
Yes	108	59.02
Possibly	29	15.85
No	46	25.14



Question six was to check the respondents' awareness of library app services. All 185 respondents answered this question. Results can be seen in Table 23 and Figure 11.

Table 23 – Do you know if your local authority provides a library app service?

Response	Number Of Responses	Percentage (%)
Yes - they have a library app service	94	50.81
Yes - they do not provide a library app service	26	14.05
No - I'm not aware whether they have a library app service or not	65	35.14



Questions nine to thirteen focus on current app users and their impression of various aspects and experiences of their local library app.

Question nine gathered public opinion on the appearance, navigability of and range of services offered through library apps. Ninety-four respondents were asked this question, seventy-eight respondents answered this question and sixteen respondents did not reply. Results are displayed in Table 24.

Table 24 – How Would You Rate the App In Terms Of Appearance, Navigation and Range Of Services?

Attribute	Number Of Responses									
	Very Poor	%	Poor	%	Neutral	%	Slightly Satisfactory	%	Satisfactory	%
Appearance. (e.g. layout, colour scheme, font)	0.00	0.00	4	5.13	13	16.67	45	57.69	16	20.51
Navigation. (how easy is it to find the service you want)	0.00	0.00	5	6.41	11	14.10	41	52.56	21	26.92
Range of services offered	0.00	0.00	4	5.13	13	16.67	43	55.13	18	23.08

Question ten asked which services on the library app the respondent has made use of. Ninety-four respondents were asked this question, seventy-four replies were received and there were twenty non-responders. Results are shown in Table 25.

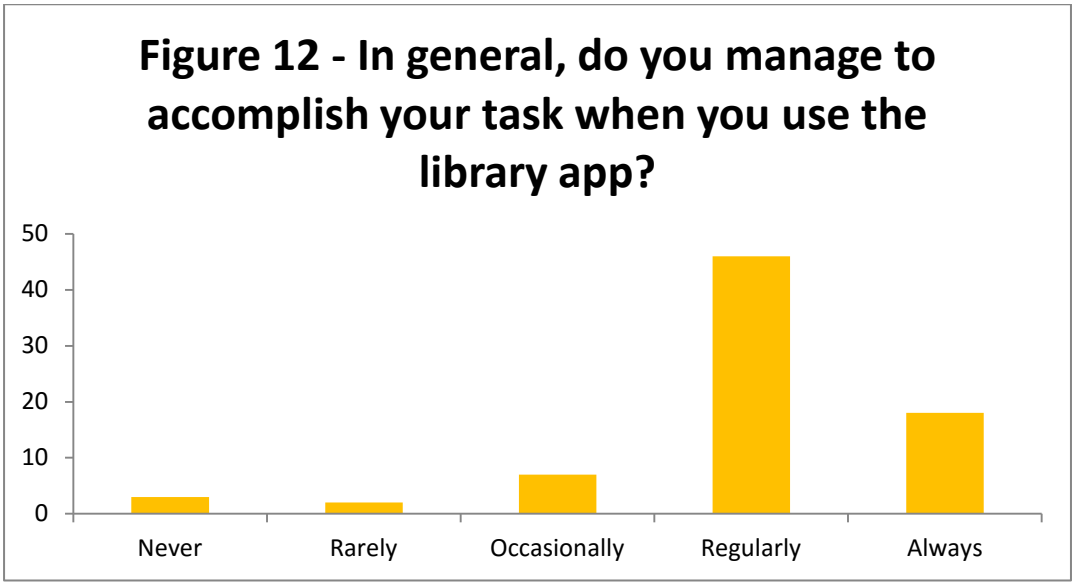
Table 25 – Have You Use The App For Any Of The Following?

Service	Number Of Responses	Percentage (%)
Search for a book	63	85.14
Renew a loan	52	70.27
Reserve a book	50	67.57
Search for an e-book	36	48.65
Search library events	18	24.32
Search for a magazine	17	22.97
Other	10	13.51
Access a research database (e.g. CREDO or ProQuest)	8	10.81
Search local events	7	9.46

Question eleven asks the respondent how often they manage to complete their task when they use the library app. Ninety-four respondents were asked this question, seventy-six replies were received and eighteen respondents did not leave an answer. Results are displayed in Table 26 and Figure 12.

Table 26 – In general, do you manage to accomplish your task when you use the library app?

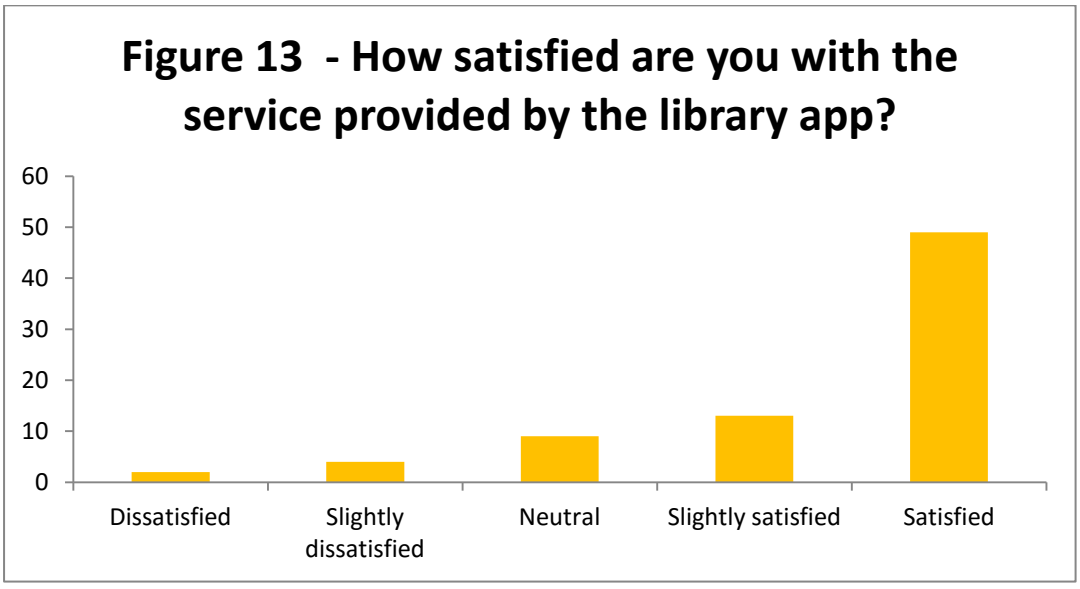
Response	Number Of Responses	Percentage (%)
Never	3	3.95
Rarely	2	2.63
Occasionally	7	9.21
Regularly	46	60.53
Always	18	23.68



Question twelve asked the respondent to rate app satisfaction. Seventy-seven responses were received and seventeen abstained out of the ninety-four respondents shown this question. Results are shown in Table 27 and Figure 13.

Table 27 - How satisfied are you with the service provided by the library app?

Response	Number Of Responses	Percentage (%)
Dissatisfied	2	2.6
Slightly dissatisfied	4	5.19
Neutral	9	11.69
Slightly satisfied	13	16.88
Satisfied	49	63.64



A Mann-Whitney U Test was performed comparing the results from Authorities App Survey question seventeen (Would you consider the library app to be a useful addition to the library service) to the results from Public Library App Survey question twelve (How satisfied are you with the service provided by the library app). With H_0 being that there is no significant difference between the populations and H_1 that there is a significant difference between the populations. The results from this were as follows:

$\sum R_{(authorities)} = 28$

$\sum R_{(public)} = 27$

$\sum R = 27$

$U = 12$

$P_\alpha = 2$

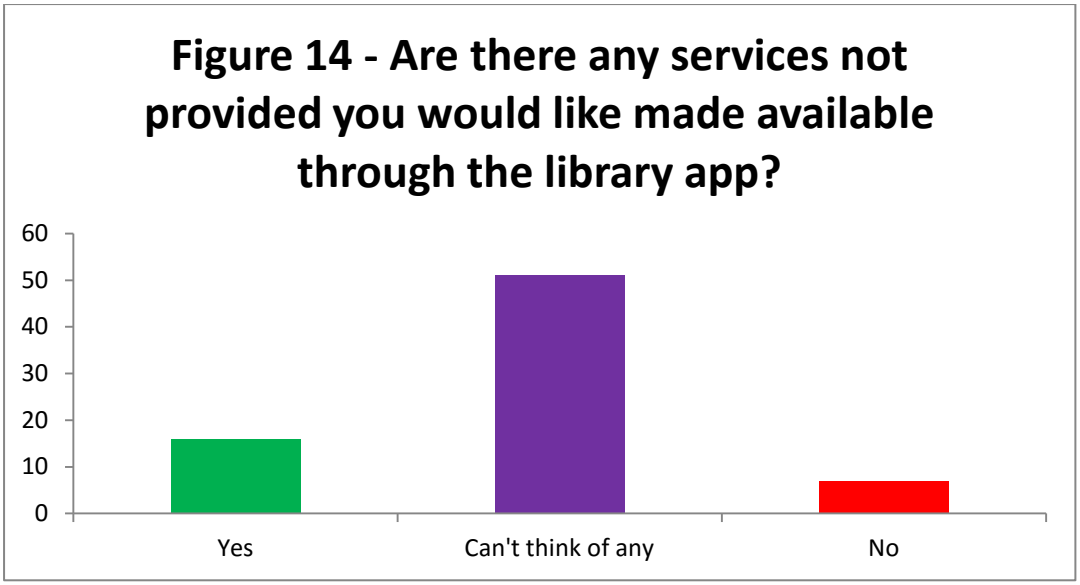
$U > P_\alpha$

Therefore H_0 was accepted and it was concluded that the opinion of the Authorities on the usefulness of an app to the library service was not significantly different from the sample population's opinion of the apps provided.

Question thirteen asked respondents if there are any services not available on the library app that they would like to see. Seventy-four responses were received from ninety-four respondents and twenty did not respond to the question. Results can be seen in Table 28 and Figure 14.

Table 28 - Are there any services not provided you would like made available through the library app?

Response	Number Of Responses	Percentage (%)
Yes	16	21.62
Can't think of any	51	68.92
No	7	9.46



From the sixteen respondents who said "yes" to question thirteen, the following key phrases were extracted:

Due date reminders, account details, reservation waiting list, SQA app, requests, control multiple accounts, loan history, reviews, self check-out, links to other services, events calendar, improved notifications, e-books/e-mags, stored lists, full search and clubs/organisations.

These were then sorted into the themes shown in Table 29, along with their frequency.

Table 29 – Frequency of Themes from Public Library App Survey Question Thirteen

Theme	Frequency
Core Library Service	6
Online Management	5
Miscellaneous	3
e-Materials	2
Events	2
General Information	1

Question fourteen asked all 185 respondents what features a library app would need to provide in order to be useful to them. A total of eighty-two comments were left in response to this enquiry. These ranged from the very simple "Easy use" and "Don't really know" type of response, to more extensive suggestions like "renew books, change personal details, check what I currently have on loan, look up stock and reserve items, alerts when items are available" and some specific requests like "Access to dyslexia friendly stuff as I have a dyslexic child". The key phrases from these comments were identified and their frequency is shown in Table 30, divided by the respondents' knowledge of a library app provision in their area.

Table 30 – Frequency of Key Phrases from Public Library App Survey Question Fourteen

Key Phrase	Has App	No App	Unaware
Search Functionality	10	4	23
Reserve Items	6	2	12
Renew Loans	9	5	16
Request	2	4	5
New Stock	0	0	2
e-Books	2	1	11
e-Magazines	1	0	3
e-Audio	0	0	1
Easy Access	6	4	5
Account Information	3	3	6
Organisation Links	1	1	0
General Information	4	5	5
Events	1	1	5
Miscellaneous	7	8	19

These were then further merged into the following themes:

core library service, e-materials, events, general information, online management and miscellaneous.

Table 31 – Frequency of Themes from Public Library App Survey Question Fourteen

Theme	Has App	No App	Unaware
Core Library Service	27	15	58
e-Materials	3	1	15
Events	1	1	5
General Information	4	5	5
Online Management	10	8	11
Miscellaneous	7	8	19

Mann-Whitney U Tests were performed to gauge the similarity of the “Has App”, “No App” and “Unaware” populations. The results are as below.

$\sum R_{(\text{Has App})} = 39$

$\sum R_{(\text{No App})} = 37$

$\sum R = 37$

$U = 12$

$P_{\alpha} = 5$

$U > P_{\alpha}$

$\sum R_{(Has\ App)} = 40$

$\sum R_{(Unaware)} = 38$

$\sum R = 38$

$U = 17$

$P_{\alpha} = 5$

$U > P_{\alpha}$

$\sum R_{(No\ App)} = 39$

$\sum R_{(Unaware)} = 34$

$\sum R = 34$

$U = 13$

$P_{\alpha} = 5$

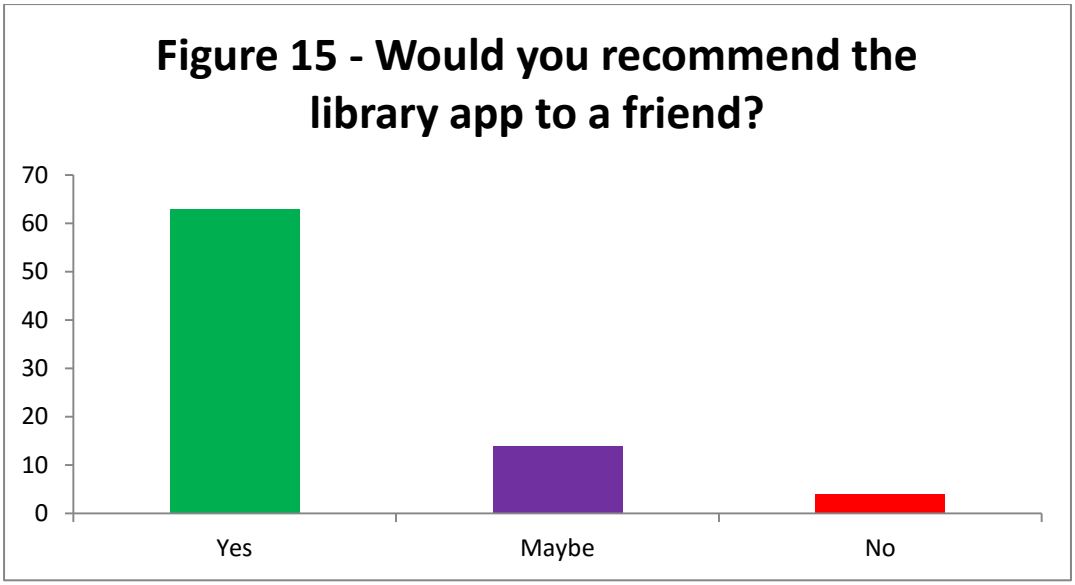
$U > P_{\alpha}$

Therefore H_0 was accepted in each case and the populations were concluded to not be significantly different from each other.

Question fifteen asked the respondent if they would recommend the library app to a friend. Eighty-one respondents out of ninety-four replied to this question and thirteen abstained. Results are shown below in Table 32 and Figure 15.

Table 32 - Would you recommend the library app to a friend?

Response	Number Of Responses	Percentage (%)
Yes	63	77.78
Maybe	14	17.28
No	4	4.94



Question sixteen asked the one hundred and eighty-five respondents if they would like to leave any general comments about library apps. Fifty-two replies were left in response to this prompt ranging from “No” to “Ensure that there is a Windows version as well and Android/iOS” and “I find them a useful, easy way to access library services”. These comments were broken down into the following key phrases:

user reviews, very useful, integral service, human interaction, no comment, app desirable, up-to-date, poor app functionality, reserve, catalogue search, good access, good app functionality, renew loans, unfamiliarity, fine payments, platform availability, limited e-services, links, anti-app, well designed, security, website issues and unavailable.

These were then sorted into themes and organised into a hierarchy as seen in Appendix 6. These themes were:

present library functions, positive opinion, negative opinion, positive app facet, negative app facet unfamiliarity, no comment and general comment.

Table 33 – Frequency of Themes from Public Library App Survey Question Sixteen

Theme	Frequency
Positive Opinion	16
Negative App Facet	13
Unfamiliarity	10
No Comment	9
General Comment	8
Positive App Facet	7
Present Library Function	5
Negative Opinion	2

Of the nine from the "No Comment" category, six came from a respondent unaware of the availability of an app, two from an area without an app and one from an area with an app.

The comments could also be broadly sorted into being positive, negative or neutral as follows in Table 34.

Table 34 – Tone of Phrase Frequency in Public Library App Survey Question Sixteen

Comment	Frequency
Positive	28
Negative	15
Neutral	27

Positive comments were drawn from the themes: present library functions, positive opinion and positive app facets. Negative comments were drawn from negative opinion and negative app facets and neutral comments were from unfamiliarity, no comment and general comment.

5.0 Discussion

5.1 Authorities App Survey

Thirteen Authorities provide an app service, four provide an app in conjunction with another enterprise, most commonly SOLUS, two Authorities have an app in development and thirteen Authorities have no current plans to provide an app. The number of Authorities not providing an app is more significant considering that some Authorities have already provided an app service for some time, since at least 2012. The fact that other areas continue to not provide such a service indicates a significantly different viewpoint on what library services offer.

One argument seems to be that a mobile-enabled website is sufficient to meet the patrons' needs and that, therefore an app is not needed. If a website is truly mobile-enabled and can adjust screen-size, allow side-ways navigation as well as up-down navigation and has touchscreen capability, then it can be a good compromise as it is accessible across all platforms. However, a website which does not fulfil these criteria is not really suited to access via a smartphone or tablet. The main disadvantages of the website are that the user must be online in order to use it and is therefore at the complete mercy of their connection to the internet and that the patron frequently has to enter log-in details. An app has the advantages of one-tap access to the library, as opposed to navigating the browser. The use of HTML5 and using a cache can allow an app to continue to work when there is no continuous internet connection. Finally, an app is arguably better placed to take advantage of future developments in smart technology (Gibbs, 2015). As the commercial sector is increasingly focusing on smartphone technology to interact with its customers, it will be imperative that the library can match this in every way and is able to provide its service in the way which their patrons are accustomed. Having a library app is about future-proofing as well as being in the pocket of every patron.

A second point to be made is that the quality of the app service in terms of the ease of use of resources and app stability were highlighted as reasons for delaying or not implementing an app. Unfortunately, the difficulties mentioned were also reflected by some of the Authorities who currently provide an app service with comments like: "When you have an app created by an outside company, you are reliant on that company to make any changes or tweaks to your app. In our experience, this has been the most disappointing aspect." It was apparent from comments from Authorities with an app that there was a sense of futility in trying to persuade their supplier to

improve functionality in ways which the library would like and which the librarians know an app should be capable of. One positive way to try to enhance influence would be for the Authorities to combine their resources and financial clout, similar to the scheme initiated by the Scottish Consortium of Public Libraries (SCoPL) for a Library Management System which awarded a contract to Civica in 2015 (Merrett, 2016). It will be interesting to see how this initiative plays out over the coming years. Another step towards coordinated action would be to have a coordinating team, responsible to all Authorities, to coordinate action and pool resources. A centrally run department in charge of a national app would mean that each Authority would not need to undergo the development of their own app and enable all areas to benefit from having an app. This would most likely be of help to the smaller library services who may struggle to afford specialist staff. Side benefits to this would be the ability to facilitate inter-authority loans, share ideas of best practice from all areas and the ability to be able to share information across Authorities e.g. shared promotion of events like Aye Write! or author presentations. One Authority raised the issue of security as a reason for not supplying an app but was not specific on whether it was concern over the security of patrons' personal information or the security of app platforms or the security of app implementation which was the main obstacle. While this is always a key issue to keep in mind, many Authorities must have already found appropriate means to maintain security in order to provide an app.

The majority of Authorities are satisfied with the core services offered by their apps. The difficulties seem to arise when another additional service needs to interact with the library app e.g. Zinio, ProQuest or Overdrive. The use of the library app as a gateway to other services is often hindered by log-in screens and password prompts which can be off-putting to many patrons. One Authority commented that: "The current library app could be improved to make integration between third party services more streamlined for the user. For example, we are working towards a single sign on for all services via the app." It cannot be overemphasised enough that it is of paramount importance for the success of a library app that it is stable, the navigation is intuitive and that the patrons' flow of actions is not interrupted unnecessarily. While this is mainly true for the core services of the library, i.e. searching the catalogue, renewing loans and reserving items etc., links to ancillary services need to be improved upon.

From the suggested list of service options offered in the Authorities App Survey, there was a degree of agreement on what were essential service provisions, such as access to the library catalogue, the ability to reserve and renew items and library locations. One Authority offered no opinion on

opening hours but otherwise this was universally provided or under development. Approximately two-thirds of Authorities offered access to e-services. This was generally the area with most Authorities selecting "Under Development", perhaps reflecting the difficulty of integrating these services in a satisfactory manner. More surprisingly, just under three-quarters of Authorities said that their app had access to or linked to social media. Since this is such a common method of communications and patrons spend such a common method of communications and patrons spend such a large amount of time on these platforms, these links should be in place. Only ten out of the potential eighteen Authorities said that their app linked to library events and only eight linked to local events. Thus it would appear that more could be done to fulfil the potential of the library app as a tool of self-promotion or to encourage of the library with its local community. Some potential services, such as inter-regional loans, links to government services and links to national institutions, were clearly not a priority as no Authority provided them. Government services and national institutions may have their own online presence but if there was to be clearly presented access to these through the library app, the library could benefit from increased traffic. Similarly, links to other reliable sources of information and support such as the National Eczema Society or Dementia UK could equally be useful with the library acting as a one-stop-shop for information and directing patrons to other trustworthy sources of information. Increased use and traffic through the app can only be good for the library.

The reason most commonly cited by Authorities in the Authorities App Survey for offering an app service as to provide another way to connect with library patrons with sixteen of the eighteen Authorities selecting this option. The second most frequent reason was the need to modernise the library service. Perceived public demand was not mentioned by many of the Authorities though how this was assessed by those that did was not disclosed. Finance, which could have been a major reason for not supplying an app, was mentioned by seven Authorities who did provide an app as they had received funding for their app from another source. It has been reported by the Society of Chief Librarians in England that they acquired funding from the Arts Council, Barclays and The Welcome Trust to be used for digital development in libraries (Society of Chief Librarians, 2016). Perhaps it would be possible for similar initiatives to be pursued with equivalent bodies in Scotland on behalf of libraries.

None of the Authorities were aware of any previous study conducted in their area to ascertain the public's view on library apps. This lack of asking for patrons' opinion on library services or for what service they would actually like points to a severe lack of forward planning on the Authorities part.

Online surveys are not difficult to set-up, as shown by this study, and a simple questionnaire which could be conducted by the librarians to gauge the level of patrons' interest could produce valuable data to help formulate future policy concerning the library service. An example of such a study can, at the time of this writing, be found at Manchester Public Libraries. Two-way communication between the library and its patrons is a key feature of Library 2.0 and 3.0 and should be an indigenous part of the library service.

With library services being put under increasing financial constraints, it would seem that any evidence showing the services footfall should be gathered. However it was evident from the responses that not all Authorities with an app were receiving even basic statistics on how often their app was accessed and even less on what services the patrons were using, for example saying in comments: ". . . do not provide regular usage info and we do not have direct access to any analytics" and even "It [usage statistics] isn't measured." On the other hand, another Authority reported that "We have access to usage statistics via the library app admin interface which is collected quarterly." Monitoring of this data should be one of the basic provisions in the app set-up. Analysis of these statistics could be useful to the library in determining how successfully, or otherwise, patrons were able to navigate a pathway their desired service. They could also highlight problems of access as most patrons will stop trying to access a service if it proves too frustrating a task and this would be reflected in the usage statistics. It is apparent that some Authorities are getting a more comprehensive service from their app provider than others. It was not clear from the survey why this was so.

5.2 Public Library App Survey

While the Mann-Whitney U Test confirmed that the age spread of the sample population was not significantly different from the general population, one hundred and eighty-five is too small a sample of library patrons to draw any sound conclusions from. It is nonetheless interesting to note the age spread of the respondents and the male to female ratio. With the predominance of smartphone technology across the age ranges who could answer the survey if there had been an equal response from each age group, the contribution should reflect the national distribution. What was found was that the younger age groups, 16 – 19 and 20 – 29 are underrepresented as was the 60+ group while the middle age groups were over-represented. While the older age group may be stereotyped as being digitally less enthusiastic, the same cannot be said for the younger groups. This may just be a spurious result of the survey but it could indicate a disconnection between the library service and

these age groups. This, if correct, is worrying as the group are the new parents and the importance of maintaining the libraries place in the life of young families cannot be overstated.

The gender ratio of respondents to the Public Library App Survey was approximately 20 – 80%, male to female. This is clearly different from the national figures, ~48 – 52%. While the gender ratio of library patrons was not determined, it seems unlikely that this is as extreme as the ratio produced by the survey. Three explanations for this imbalance are possible.

There is a built-in flaw in the survey which has resulted in significantly fewer male respondents than female. This could be caused by the open-ended nature of an online survey being reliant on volunteers to promote and answer the survey. More direct methods like interviews or face-to-face questionnaires may have produced a more balanced group of respondents.
Male patrons are less amenable to answering survey questions, though there does not seem to be much evidence to support this.
The population of library patrons could have a heavy gender imbalance and thus the survey respondents reflect this. If this is even remotely close to the truth, then it would highlight a major problem for the library service, suggesting that there is a disconnect between them and a sizable portion of their potential patrons.

In all likelihood, it was a combination of factors which led to the gender imbalance in the sample population. However, the lack of Authorities surveys on app potential suggests that the monitoring of active library patrons may not be as frequent as it could otherwise be.

The results on mobile ownership were as expected in the sense that the survey subject openly involved smart technology, the vast majority of the respondents owned a smart device. Less than 5% did not or preferred not to say. More unexpected was the fact that most owned both a tablet and smartphone device. Over double the respondents had both compared to having only a smartphone and more than ten times those with only a tablet device. The large number of tablet owners would support the suggestion that people are as comfortable with the technology at home as on the move, as the tablet may have replaced the laptop or desktop in the home. This trend is likely to continue making the case for developing an app to make use of smart technology even stronger as facilitating access to the library through these devices becomes more important. The modern public will expect a service to offer an app. There will not be loud complaints if it is not

there, the library will simply be ignored as being inaccessible and out-of-touch by a large portion of the population. People will simply look to sites like Amazon or Google for what they want.

When asked if they would make use of smartphone or tablet technology at their local library if it was made available, approximately 75% of respondents said "yes" or "possibly" while 25% said "no". This would appear to indicate that there is potential for this type of service with the library's current patrons. At the current time, there does not seem to be quite the same drive within library services to provide access to smart services as there has been in the past to provide access to computers and the internet. Even though many patrons had their own smart device, the fact that so many indicated their interest in seeing them at the library would indicate that there is a gap which the library could fill. Perhaps the library could look more towards running classes on how to make use of this technology or even have sessions where patrons bring their own device, if the library is concerned about providing such devices themselves. It could be argued that, as smart technology becomes more ingrained into society, those without access to it or the ability to make full use of it will be at a disadvantage. This is where the library can step in. It would be worth considering that, as current resources become redundant these could be replaced with smart devices. Therefore this access can be introduced naturally over time.

Closer examination of the responses to the question asking whether respondents were aware whether their library offered an app service or not yielded the following results:

- 5 respondents answered yes when it should have been no.
- 3 respondents answered no when it should have been yes.
- 18 respondents answered unaware when the answer was no.
- 47 respondents answered unaware when the answer was yes.

The small number who falsely replied yes could have been mistaking a mobile-enabled website for an app or just misinterpreting what was being asked. It is understandable that some respondents from areas without an app may have been uncertain as to how to respond to the question and thus chose the "unknown" option. That fifty or the one hundred and eighty-five respondents either did not know or incorrectly thought that there was no app available from their library service when there actually is, indicates the need for better promotion of services. This would appear to show a lack of connection between the library service and its patrons. Libraries are going to have to be proactive if they are going to have the impact and relevance that they want.

The response from app users was, in general, positive and ranged from "satisfactory" to "very satisfactory", accounting for 78% of respondents. These were similar for all three aspects of the app: layout, navigation and services offered. As all three aspects scored almost identically, this indicates that a good standard of basic design and functionality has been achieved. This reflects well on the services provided as used by the respondents, however, the frequency with which they used the service or whether they used it beyond the core services was not determined. The fact that no one rated the apps as "very poor" is encouraging.

The app usage statistics were to uncover which aspect of the existing library apps is the most used. Seventy-eight out of ninety-four survey respondents who were asked this question left a response to this enquiry. These turned out to be the core library services, i.e. to search the catalogue, renew a loan and reserve an item at 85%, 70% and 68% respectively. Searching for an e-book was the next most popular task at 49%, this would suggest that, even though only two-thirds of Authorities offered links to e-books through the app, the desire to use this service is strong. Other services which were used by a smaller number of users included e-magazines, access to online databases and information on local and library events. In relative terms, twelve Authorities provide access to e-books and e-magazines and ten provide information on library events, yet 24% of respondents had used the library app to look at library events compared to 23% who had used the app to access e-magazines. This could indicate a higher demand for access to library event information or could indicate a depressed usage of e-magazine access through the app which could warrant investigation. 11% of respondents indicated that they had accessed a research database through the app even though only eight Authorities provide this. While a relatively small number, this shows that such databases are a valuable addition to the app and provide another line of communication to the public. If a subscription for such services is already being paid by the libraries, it makes sense to provide as many methods of accessing them as possible in order to get the best value for the libraries money.

The rate of success in completing a task for the public is overall very high with 84% of respondents saying that they "regularly" or "always" achieve their goal when using the app. This is a further reflection that as far as core activities are concerned, the library app is performing to an acceptable standard. In this case, however, there were three respondents who selected the most negative option of "never". Despite the small sample, this does show that there is a minority of patrons who encounter difficulties in using the app. It is possible that there is a concealed number of patrons

who have similar experiences but have not voiced them. Therefore the library needs to remain vigilant and encourage users to report problems and not assume that no reports equate to no problems.

The results from the Mann-Whitney U Test comparing public satisfaction with the library app against the Authorities opinion on library app usefulness showed that the two populations were not significantly different. This agreement shows that both the public and the Authorities generally place the same value on the library app. The majority of participants, 64%, chose the most positive category to describe their experience with the app, however, once again there is a small number with a poor experience who selected a negative response. While only a small percentage, the library needs to investigate these cases, analyse the root cause of these problems and resolve any issues where possible.

While librarians and IT staff are aware of the potential capabilities of an app service beyond the straightforward core services, the same cannot be said for the general public. Therefore the comments received tended to be specific to an Authority app or to the patron themselves rather than being applicable to all Authorities. For example, some said "suggest a book for purchase if not in stock", "clubs & organisations" and "reminder of due dates for return" when asked what services not currently provided they would like through the app. Comments left by respondents without an app also show that basic core library services are their main concern saying "reservations renewals, library card, reminders, branch times", "alerts to new books, book renewals and e-book access" and "find, reserve, renew books. Pay account charges (fines, hires etc.). Book tickets to events. Download e-books, e-audio and e-magazines. Book reviews." One service which was mentioned several times was the capacity to view more information on items, a synopsis, other reader reviews and library recommendations. One parent wanted to be able to use their children's account saying: "ability to control multiple accounts – e.g. my own AND those of my children who I am counter signatory for". While it is possible to understand the reasoning behind this, it could also present technical or even legal difficulties. The issue of access to specialist services and resource materials was also raised by the public: "accessing databases e.g. family history resources" and "access to dyslexia friendly stuff as I have a dyslexic child". This chimes with the desire of some Authorities to expand the functionality of the app and demonstrates that some of the public is already looking for services beyond the core library offering. A few respondents referred to the possibility of other services like "self-service options" and "get me straight into every online service without passwords". These public comments support the decision of some Authorities to look into providing

these precise functions. It was also mentioned that platform availability beyond iOS and Android would be welcome: "Ensure that there is a Windows version as well as Android/iOS". The survey itself highlighted to some extent the public's unfamiliarity with library apps: "I am not aware of such apps being widely available; are they advertised?" and "I am unfamiliar with library apps. This survey has made me wonder what apps are available from the library". This would indicate that the libraries need to work on promoting their apps further and familiarise the public with this technology. Some patrons expressed a strong opinion in favour of an app: "I think they should be an integral part of any library service in this day and age" and "I'd use one if there was one." While others had either a very specific complaint: "I can't scroll down the list of libraries in 'My Local Library'. It stops after Dennistoun!" and a few held a distaste for the technology in general: "soulless & pandering to the 'now, I want it done now or I don't want it at all' section of society". There were several comments left of a complimentary nature which demonstrated the successful implementation of a library app by some Authorities: "So easy to reserve books – absolutely brilliant. People in my book group buy books but I just search and reserve at the library" and " I find the library app very useful, I use it quite often and have become so used to it that I'd really miss it if it was discontinued."

As a final cherry on the cake, over 75% of respondents would recommend the library app to a friend and less than 5% would not. Overall, the library apps appear to be well-regarded at the moment.

5.3 Discussion from the Literature Review

5.3.1 Web 1.0 – 3.0

The literature description of Web 2.0 and its' capabilities is a website which can be viewed but not interacted with. This is certainly present in all library services, whether independent or subsumed within an Authority system. Most libraries have adopted at least one aspect of Web 2.0, namely social media. However some appear to be rather poorly presented, it is though, having set up a social media platform, the library does not use it in a natural way. It appears awkward and used in an unwieldy manner. It is as if little forethought has been given as to how it should be used. There are some examples of excellent implementation. These should be taken as examples of best practice and learned from. Tagging, a facet of Web 2.0, could be used to allow patrons to identify key features for themselves. The library supplies the basic framework from which the patrons can build upon. This would allow greater interaction between the patron and the library and assist in

developing a more proactive library community. QR codes, another feature of Web 2.0, could be used as a means of directing patrons to library services and coincidentally acclimatising them to the use of smart technology within the library. Web 3.0 indicates the way developments are likely to go in the future. Capabilities such as the semantic web, cloud computing and the language in which library resources are coded will have to be taken into consideration. Adapting to these changes will likely be complex, time consuming and expensive. This would argue for a unified approach from all Authorities. A piecemeal approach, as has been the case with library apps, will not work.

5.3.2 Library 1.0 – 3.0

Library 1.0 was the outdated view of library services; top-down hierarchy, library-centric and inflexible. All current libraries have moved on from this model. As Web 2.0 infiltrated into libraries, it acted as a catalyst for change. The ideas of Library 2.0 were gradually adopted. Libraries have taken to being cooperative rather than dictatorial in their approach. Encouraging a more equitable, two-way dialogue with patrons. The conversion from physical to digital to the online accessibility of library resources and the loosening of the control of access were a manifestation of Library 2.0 attitudes. The impression from the survey is that the controlling elements in Authorities are less willing than librarians in following this change in emphasis. Thus what librarians might want to do is sometimes stymied by a Library 1.0 attitude from the Authority. Full implementation of Library 2.0 is in complete contrast with the academic and specialist libraries. With their greater autonomy and influential patrons, whose self-interest is helped by good library services, these libraries have been able to progress much further in incorporating Library 2.0, as shown by the plethora of papers documenting Web 2.0 and Library 2.0 in action in these institutions. The number of papers focusing on local public libraries is distinctly scant. Good practice of Library 2.0 in public libraries tends to have been reported through blogs or occasional e-magazines but with very little in scholarly journals. Library 3.0 is based on the concept of tailored individual experience. For libraries, as stated for Web 3.0, this involved updating systems to be compatible with the wider semantic web. Librarians attitude will need to shift again to being a guide to all information regardless of source rather than a provider of kept information. As previously stated, this is a long-term objective but needs urgent attention and planning now.

5.3.3 Commercial Apps

The commercial sector is the main contributor to app development. It provides examples of both good app design and innovation and therefore represents the principle competitor to libraries and the main challenger for its' services. As well as offering both intuitive navigation and functionality, commercial enterprises offer a highly accessible, convenient and rich experience to customers through their apps. Already Web 3.0 has been incorporated into these facilities, e.g. voice search capability, which highlights the speed at which the commercial sector has shown itself to be capable of adapting, in comparison with libraries where many services are still to even provide a basic app. The situation is reminiscent of when supermarkets branched out into non-food sectors, for example, books. By creaming off the most popular and profitable portions of the sector, they starved the high street bookshops or revenue, leading to the demise of many. Likewise, this pattern could repeat itself in terms of information seeking with the danger of commercial enterprises taking the lion's share of clients and superseding the libraries as the first-choice source of information. Libraries have to compete by diversifying their activities and radically improving the digital offering.

As public bodies to not have access to the same levels of financial or technical resources, they need to cherry pick their battlegrounds and promote their unique aspects which commercial services would be unable to match. Aspects like: being a free service, trustworthy, free of advertisements, unbiased, experts in the field and the provision of a personalised local service.

5.3.4 Government and Specialist Library Apps

Government apps are an example of how large public organisations foresee conducting business in the future. In contrast to the historic complex, obfuscating and lengthy paper document, these apps try to be simple and straightforward using plain English and easy navigation. A good design example for the library app.

The literature provided examples of facilities a library app could provide. While these were taken from academic institutions, the requirements of the population from the survey broadly matched those of the students with only a slight difference in emphasis of priorities.

5.3.5 Concerns Over App Supply in Public Libraries

When considering the ramifications of access to non-library apps through the library, it is paramount that libraries maintain a position of neutrality so should not promote any external app. However, a catalogue for referral purposes could be useful but it should be made clear that inclusion does not imply recommendation. The question of fee-based or subscription apps is at best problematic. The simplest solution would be to not involve the library at all. Having an account locked to a device owned by the library might be possible but it is not difficult to foresee problems of access, security and administration arising from this arrangement. Limited specialist apps could be provided for specific groups of patrons, e.g. dyslexic or Braille apps. Since these much smaller numbers of patrons would be involved, supplying these on a library owned device would be feasible. In terms of security, the library is already reliant to some extent upon third parties, such as internet providers. Therefore a few specialist apps would be a minimal risk. Concerns over security should not deter libraries from introducing a small number of targeted apps. It is still incumbent on libraries to regularly monitor their security protocols.

5.3.6 Changing Expectations

The change in expectations of the public is a consequence of the changes in the functionality and cost of the technology. This was illustrated in the ‘early' papers where taking photographs was a principal activity on mobiles. Within a few years, the use of social media has taken over as the main activity. The speed of uptake of smart technology shows the level of enthusiasm the public has for embracing the latest gadget. There is no reason to think that this enthusiasm will wane in the future. As improved functionality is introduced, it will rapidly evolve from being a novelty to being the norm. The public services, including the libraries, will have to adopt some of these, the trick being to choosing which ones and doing so in a time appropriate manner. For the foreseeable future, libraries will always be playing catch-up with the commercial sector.

5.4 Critique of the Survey Questions

The survey questions were designed while keeping in mind the advice offered by Bethlehem. A critical evaluation of the public survey prompted the following observations. As a whole, the questions were worded in an appropriate manner, were, for the most part, clear and concise and the question order followed the simple/factual to complex/opinion standard. The survey was deemed

to be of a suitable length to illicit a useful amount of information without taking too much time from the respondent. With hindsight, it would have been beneficial to ask the public which platforms their devices run on. This would have helped to determine which platforms the Authorities need to take into consideration beyond iOS and Android. In retrospect, some questions could have been better constructed. Questions 4 and 6 have redundant "Yes" and "No" components in their fixed answers, which could cause confusion. On examination of the results, this does not appear to have happened. Question 5 was hypothetical however it was considered simple enough that its inclusion was allowable. Question 8 should have had more definitive response options as "Rarely" "Occasionally" and "Regularly" are all subjective terms. It is probably the weakest question of this survey. Questions 14 was deliberately left very open-ended, this was done on purpose to avoid biasing the respondent and supplying them with options which they would not have chosen otherwise. The intention was to gain an appreciation for the public's concept of the essentials of an app service. A flow diagram depicting the pathways through the Public Library App Survey can be found as Appendix 7. In retrospect, a better flow for analysing the comments would have been to direct different responses from Question 6 to different versions of Question 14. This way these comments would have been separated from the beginning rather than mixed together.

Upon similar evaluation, the following reflections were made regarding the Authorities App Survey. It is of suitable length, language, clarity and sufficiently comprehensive to gather most of the required information. The only caveats of this survey are that it should have included a question for authorities on whether their app was developed in-house or bought in and a question asking which platforms the library app is available on. In retrospect, there may have been confusion caused in Question 4 with the option "Yes, in conjunction with another authority or enterprise." Some authorities used a commercial package to manage their app and considered this to be "in conjunction" whereas other authorities under the same situation considered the app to be solely their own even if it was supplied by a commercial company. It may have been better not to have had the "or enterprise" as part of the response as the intention was to uncover whether different Local Authorities worked jointly on their app. Question 11 deliberately attempts to cover as wide a range of potential services as possible; this resulted in a large list of options which would have been awkward to display in a different way. Question 19 was for permission to ask follow-up questions. A flow diagram for the Authorities App Survey can be found in Appendix 8.

6.0 Conclusion

With 40% of Scottish Authorities having no intention of providing a library app, there is a distinct possibility that libraries in these areas may become irreparably disconnected from a significant portion of their potential patrons. In the long term, even mobile-enabled websites will not suffice as app development increasingly outpaces that of websites. One of the main reasons for not having an app was lack of finance, which is understandable, however some Authorities have managed to access funding through external agencies. The other reason given was that the introduction of an app was low priority. This begs the question: who determines the priorities, as the updating of library services should be a continuous process, surely upgrading digital services is part of this. Contrast this with other Authorities reasoning for providing an app service, opening up communications with patrons and to modernise the service, both acceptable lines of reasoning. However, this contradiction between the groups of 'have' and 'have not' cannot be good for the library service across the country. The mechanics of app design are common to all library apps and do not need to be individually produced. Overall, there is a case to be made that cooperation between all Authorities to develop a common system which could then be customised by each individual Authority would be to the benefit of all.

For the 60% of Authorities that do have a library app. The core services as provided are satisfactory as judged by the librarians and public alike. There is more criticism from both groups when other parties are involved. Seamless access across different services is a key feature of commercial apps and should be emulated in the library app. Clunky navigation only serves to put off patrons.

Looking across the currently available apps, there is some variety in the provision of services. This could be down to different priorities across the Authorities or perhaps they were not all fully aware of the possibilities of the app. Either way, if there was more discussion between Authorities it would be simpler to exchange ideas of best practice.

The lack of public consultation over matters such as the library app is disappointing. Commercial enterprises are constantly surveying their clientele to determine their likes, dislikes, what is trending or not and general opinion of services offered. Libraries should have a similar mechanism in place. This unwillingness to determine the opinion of patrons suggests that there is still a vestige of Library 1.0 in their approach. Patrons can be a rich source of ideas for improvement. More effort should be made to improve communications and to determine exactly what patrons want from the library.

On similar lines, the number of respondents unaware of the presence of an app from areas providing such a service clearly shows that current promotion is not reaching all patrons. Better promotion is required. Advertisement need not be expensive, simple poster campaigns or just having the librarians enquire whether each patron has tried the app or not would be enough, provided the effort is sustained.

Libraries are under a lot of pressure at the moment, financially from the Authorities, who themselves are under financial constraint, from the commercial sector which is increasingly encroaching upon the information and leisure services offered by the library and from an increasing percentage of the population who do not regard reading as a regular social activity. The library app has a definite role to play in helping the public library service to meet these challenges. An additional means of communicating with patrons increases the libraries exposure to sectors of the community who otherwise might not consider using the library service.

6.1 Further Work

This exercise could be repeated every two years in order to build up a historical record of developments in library technology and public attitudes towards its implementation in the library setting. Archival evidence could be useful in informing future decisions as well as being of some historical interest in the evolution of the library.

A different style of survey with focus groups or group/individual face-to-face interviews could be employed to help address the imbalances (age range, gender ratio and geographic spread) which may have been an inherent weakness in this research. Stricter control of the sampling should lead to the collection of more reliable information.

As this exercise was the first of its kind, a similar study conducted in the other Home Nations could provide a useful comparison and expose interesting similarities and differences in the approach to digital library services.

A follow-up exercise examining an area not covered by this study. Potential topics to examine could be: platform availability, security issues, usage statistics, mobile-enabled websites, the adoption of tablet technology to replace desktop computers and the feasibility of the implementation of future facilities such as iris scanning, self-checkout and voice recognition.

6.2 Recommendations

All Authorities should provide a basic app that delivers all the core services. Enhancement beyond this can be done later if warranted.

Authorities should work together, either in developing their own app, in which the librarians would have more influence over the inclusion of services, or in choosing a common commercial supplier. If a commercial system was chosen, the combined approach should result in a greater say in the cost and content of the app. A common basic app for all Authorities would allow for services such as inter-authority loans, promotions and advertising of events, for example World Book Day, Aye Write! or the Edinburgh Book Festival.

Development of a single log-in which provides access to all services, particularly to all external e-services. A common comment from both the public and the librarians was the desirability of such a facility.

Each Authority should conduct its own survey to determine the opinion of their own patrons to help make better informed decisions on the future direction of the library service. This survey garnered 185 responses across the country. A single Authority should be able to hone in more effectively on their own patrons in order to collect data relevant to them.

All Authorities should be able to collect and collate their own app usage statistics from their app provider. Evidence of library usage is always useful in countering the notion that libraries are no longer necessary.

Authorities should ensure their app links to any online databases to which they subscribe. These are high quality but fairly underutilized resources. Promoting these brings kudos to the library and improves the cost-efficiency of subscribing to these facilities for which the library already pays.
The library should actively foster links with local organisations and clubs, allowing the app to act as the go-to hub for promoting local events in its calendar. Thereby increasing the use of the app and consequently of the library itself.

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Appendix 1 – Scottish Authorities Survey

Q 1 – Please state which Council Area you are responding on behalf of.

Q 2 – Please state your gender.

- Male
- Female
- Prefer not to say.

Q 3 – Please indicate the age range to which you currently belong.

16-19	20-29	30-39	40-49	50-59	60+	Prefer not to say.

Q 4 – Do you provide a library app service?

- Yes, we provide our own library app service.
- Yes, in conjunction with another authority or enterprise. (please state)
- In development
- No

Q 5 – Has there ever been a survey or questionnaire about the potential for or reception of library app services in your area?

- Yes
- No
- It is under consideration

Q 6 – Do you actively promote your app service?

- Yes (How?)
- In development
- No

Q 7 – What reason(s) influenced the decision regarding provision of a library app service? (choose as many as apply)

- ☐ Budget constraints.
- ☐ Staff reticence.
- ☐ Lack of staff training.
- ☐ Deemed to be low priority.
- ☐ Rate of change in technology too fast.
- ☐ Policy decision.
- ☐ Insufficient staff to facilitate record updates to a suitable format for app development.
- ☐ Waiting to see the uptake/results from other authorities.
- ☐ Other. (please state) _____

Q 8 – When do you expect the library app service to become available?

_____

Q 9 – Why was the decision made to operate the library app service in conjunction with another authority? (choose as many as apply)

- ☐ Council services normally provided jointly.
- ☐ To pool staff expertise.
- ☐ To spread operational costs.
- ☐ To better integrate library services between authorities.
- ☐ Other. (please state) _____

Q 10 – What factors influenced the decision to provide a library app? (choose as many as apply)

- ☐ Public demand.
- ☐ Funding from an external source.
- ☐ Need to modernise.
- ☐ To provide another way to connect with patrons.
- ☐ To improve efficiency.
- ☐ Other. (please state) _____

Q 11 – Does the app allow access to, information on or link to:

	Yes.	No.	Under development.
Library locations	○	○	○
Opening hours	○	○	○
Library catalogue	○	○	○
Reserve/renew/loaned items	○	○	○
E-books	○	○	○
E-magazines	○	○	○
Audio-books	○	○	○
Music	○	○	○
DVD/Blu-ray	○	○	○
E-databases (e.g. CREDO or ProQuest)	○	○	○
Inter-regional loans	○	○	○
Computer booking	○	○	○
Room booking	○	○	○
Tutor booking	○	○	○
Library events	○	○	○
Local events	○	○	○
Local heritage	○	○	○
Council services	○	○	○
Government services	○	○	○
Health services	○	○	○
Other bodies (e.g. Citizens' Advice)	○	○	○
National Institutions	○	○	○
Ask a librarian service	○	○	○
Recommended apps	○	○	○
Social media	○	○	○

Q 12 – Does the app provide a service not previously mentioned?

○ Yes. (please state) ☐

○ No.

Q 13 – Are there any additional services you would like to provide through the app?

☐

Q 14 – Do you keep a record of download/usage figures for the app?

- Yes
- No

Q 15 – Would you be willing to provide app statistics for research purposes?

- Yes. (please provide preferred email address for contact)
- No.

Q 16 – How is library app performance measured?

Q 17 – Do/would you consider the library app to be a useful addition to the library service?

Definitely yes	Probably yes	Maybe	Probably not	Definitely not

Q 18 – Do you have any additional comments you would like to make about library apps?

Q 19 – Would you be willing to be contacted again in future for follow up questions?

- Yes. (please leave preferred email address)
- No.

Appendix 2 – Scottish Public Library App Survey

Q 1 – Please select the Council area in which you live.

Q 2 – Please state your gender.

- Male.
- Female.
- Prefer not to say.

Q 3 – Please indicate the age range to which you currently belong.

16-19	20-29	30-39	40-49	50-59	60+	Prefer not to say.

Q 4 – Do you have access to a smartphone or tablet device?

- Yes - smartphone.
- Yes - tablet.
- Yes - both.
- No - neither.
- Prefer not to say.

Q 5 – Would you make use of smartphone/tablet technology if it was made available at your local library?

- Yes.
- No.
- Possibly.

Q 6 – Do you know if your local authority provides a library app service?

- Yes - they have a library app service.
- Yes - they do not provide a library app service.
- No - I'm not aware whether they have a library app service or not.

Q 7 – Have you downloaded the library app?

- Yes.
- No.

Q 8 – Do you make use of the app?

Only downloaded it. Rarely. Occasionally. Regularly.

Q 9 – How would you rate the app in terms of:

	Very Poor.	Poor.	Neutral.	Satisfactory.	Very Satisfactory.
Appearance. (e.g. layout, colour scheme, font)					
Navigation. (how easy is it to find the service you want)					
Range of services offered.					

Q 10 – Have you used the app for any of the following? (choose as many as apply)

- Search for a book.
- Search for an e-book.
- Search for a magazine.
- Reserve a book.
- Renew a loan.
- Search library events.
- Search local events.
- Access a research database (e.g. CREDO or ProQuest)
- Other. (please state)

Q 11 – In general, do you manage to accomplish your task when you use the library app?

Never. Rarely. Occasionally. Regularly. Always.

Q 12 – How satisfied are you with the service provided by the library app?

Dissatisfied. Slightly dissatisfied. Neutral. Slightly satisfied. Satisfied.

Q 13 – Are there any services not provided you would like made available through the library app?

- Yes. (please state)
- No.
- Can't think of any.

Q 14 – What services would a library app need to provide to be useful to you?

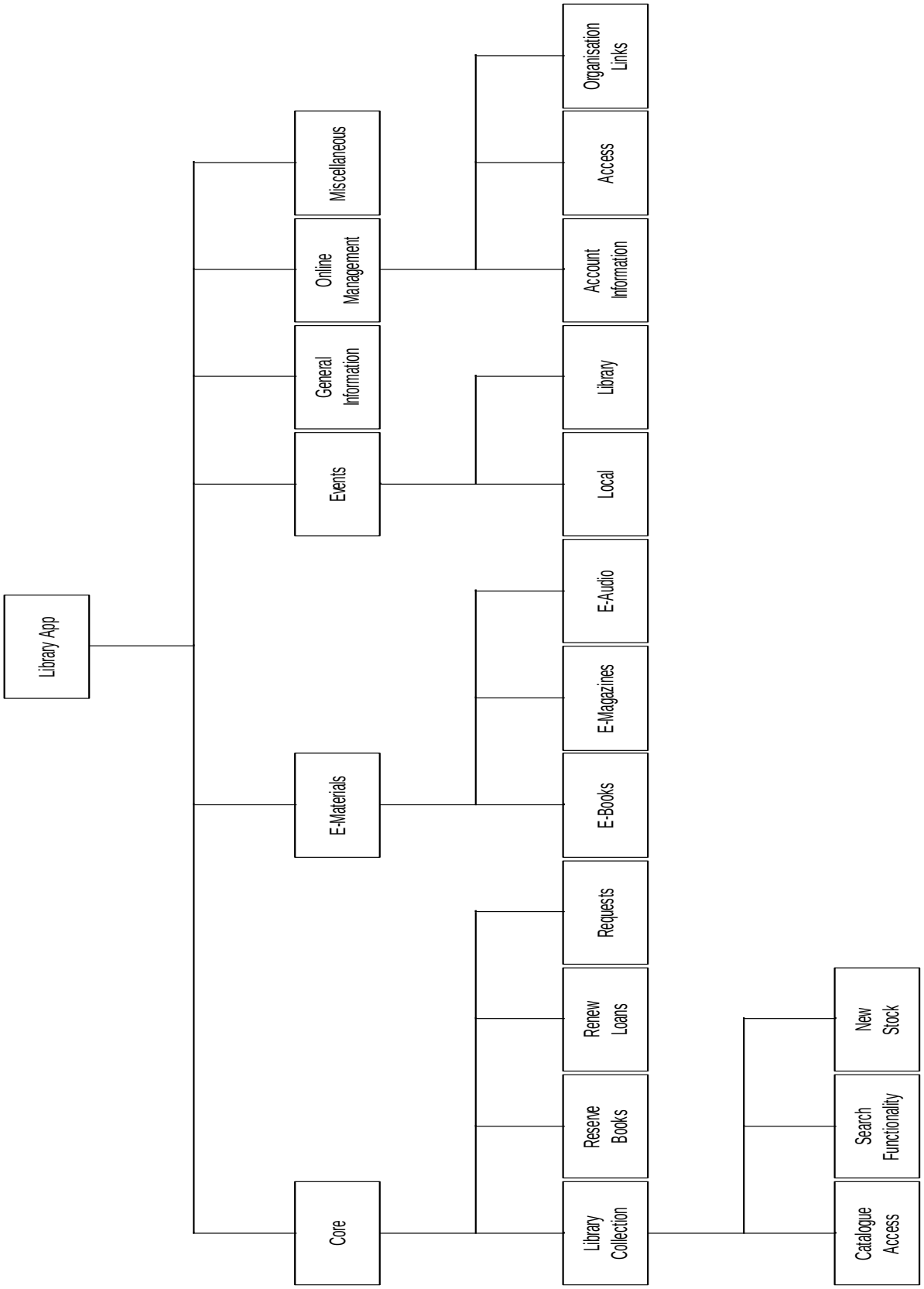
Q 15 – Would you recommend the library app to a friend?

- Yes.
- Maybe.
- No.

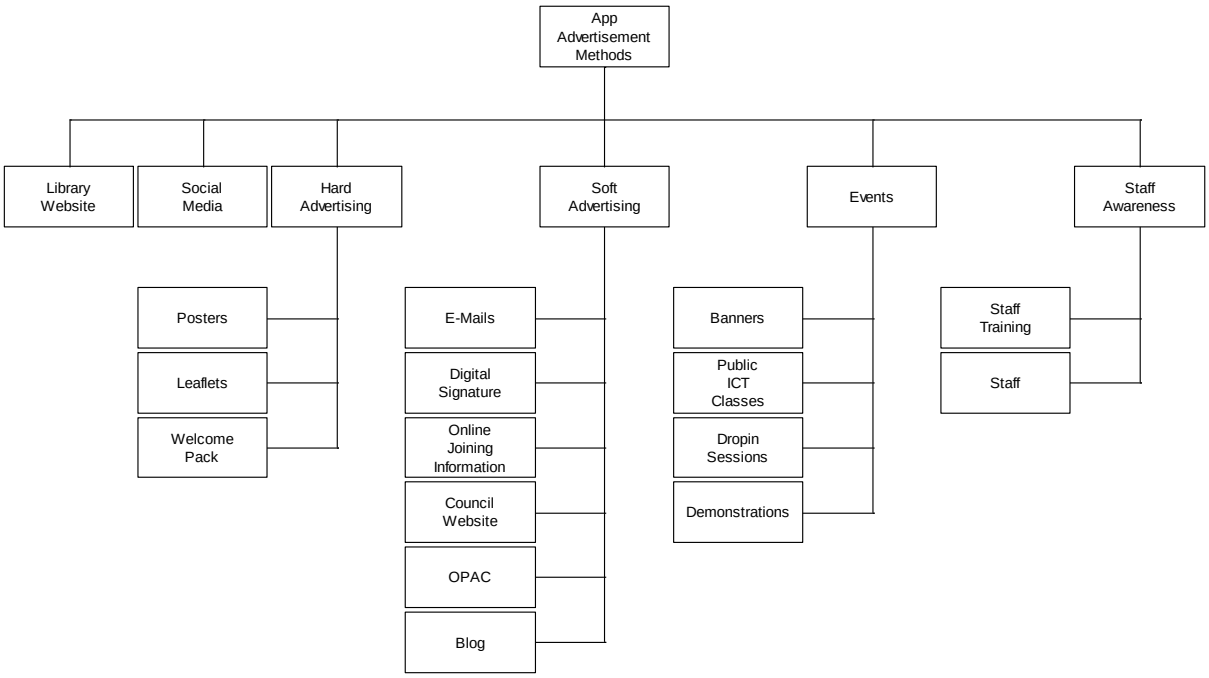
Q 16 – Are there any comments you would like to make about library apps?

Appendix 3 – Scottish Public Library App Survey Promotion Poster

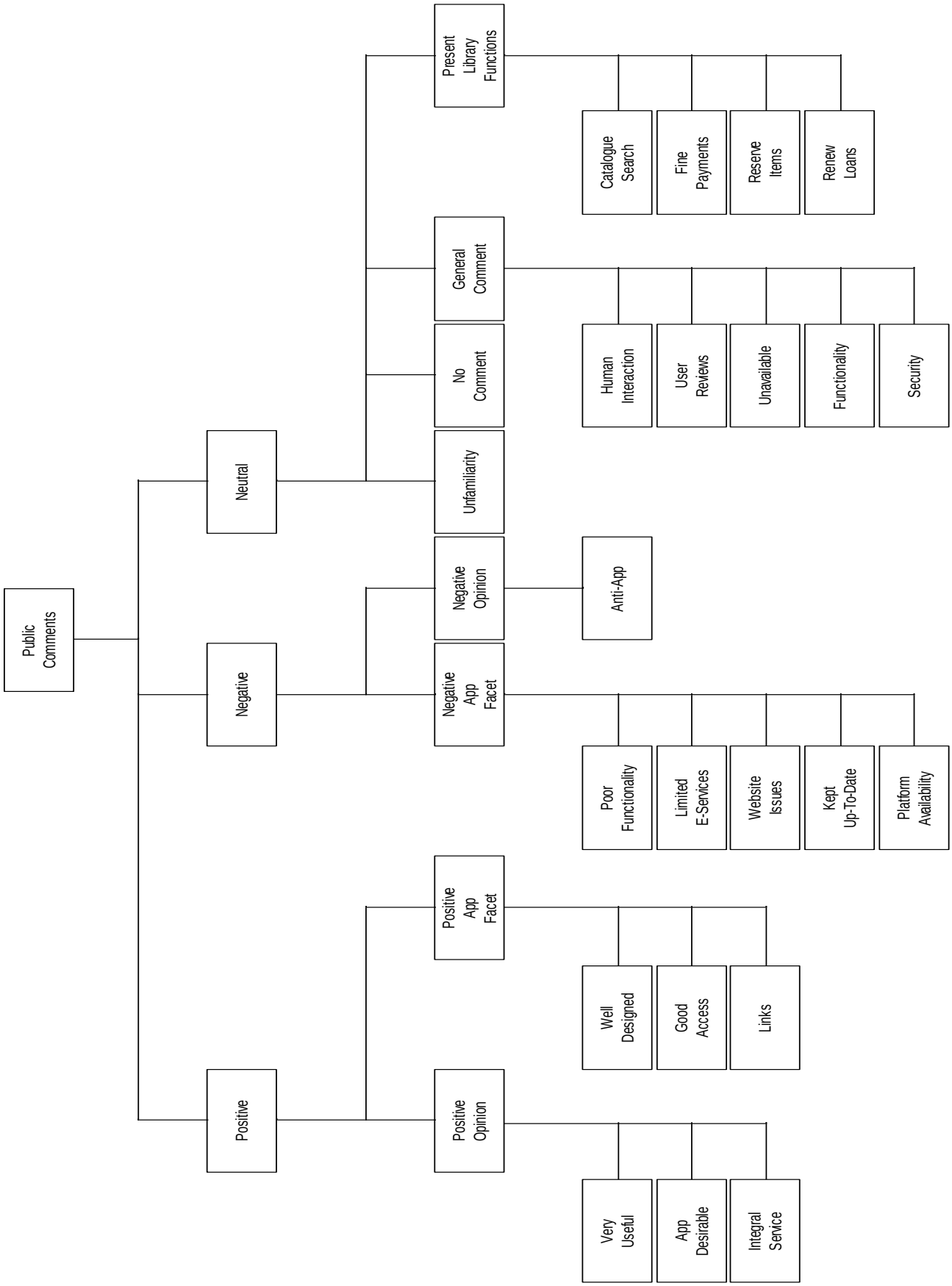
Appendix 4 – Scottish Public Library App Survey Content Hierarchy Question 14



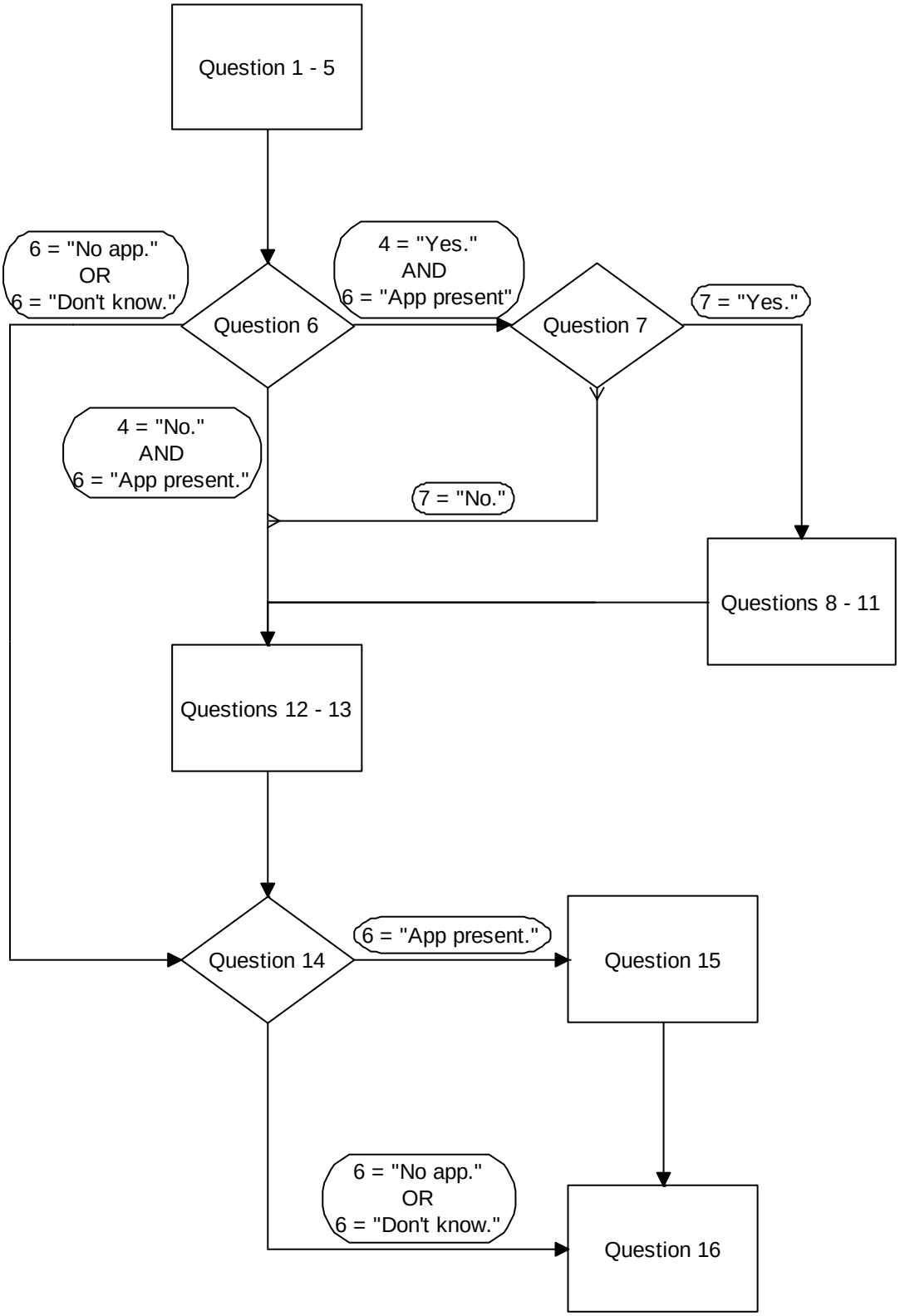
Appendix 5 – Scottish Authorities Survey Content Hierarchy Question 6



Appendix 6 – Scottish Public Library App Survey Content Hierarchy Question 16



Appendix 7 – Scottish Public Library App Survey Flow Diagram



Appendix 8 – Scottish Authorities Survey Flow Diagram